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West Europe Report

SCIENCE AND TECHNOLOGY

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NETHERLANDS ADVANCES IN ARTIFICIAL SUPER FIBERS

Amsterdam DE VOLKSKRANT in Dutch 5 Oct 85 p 35

[Article by Hans Friedeman: "Netherlands Leads the Way in Super Strong Fibers"]

> [Excerpts] Super strong artificial fibers are among the new materials that are expected to make the world of the 1990's look very different. The Netherlands is leading the way in this field, according to a specialist on super strong fibers at a symposium in Utrecht this week. Hans Friedeman sorts out the macromolecules.

New materials were the subject of a popular-scientific symposium organized this week in Utrecht by the Scientific Information Service at the Royal Dutch Academy of Sciences. Among other things, they discussed new ceramic materials that you can make cars or artificial bones from, new applications for glass, new magnetic materials, and materials for computer chips.

Although the Netherlands is not exactly leading the way in new materials technology, there is at least one striking exception: the development of super strong artificial fibers. AKZO/ENKA and DSM [Dutch State Mines] have each developed an artificial fiber material in recent years that is many times stronger than its own weight in steel. This super fiber technology could give an important push to Dutch industry in coming years.

Miracle Material

Following the glass fiber that was already being used to an increasing degree in the 1950's to strengthen man-made parts for aircraft and boats, the next miracle material was the carbon fiber. It was 5 times stronger than steel and 2.5 times stronger than glass fiber. Besides, it was 4 times stiffer. This light but very strong material turned out to be extraordinarily well suited for use in cars, aircraft, and ships as well as in a wide variety of other objects, ranging from tennis rackets, poles for pole-vaulting, and other sporting goods to the Space Shuttle and ultra-centrifuges to enrich uranium.

More recently, DuPont in the United States and ENKA/AKZO have developed even stronger artificial fibers from aromatic polyamide, also known as aramide. The macromolecules of aramide can be broken apart in an acid and will then behave like stiff little rods and lie more or less parallel to one another in higher concentrations, like a mass of trees in a river. If you spin such a solution, fibers take shape almost by themselves, the macromolecules of which lie parallel to the direction of the fiber. The result is a super strong fiber, even stronger than carbon fiber and almost 7 times stronger than steel.

The aramide fiber was marketed by DuPont under the brand name "Kevlar." ENKA/AKZO developed almost the same fiber through another manufacturing process and are marketing it as "Twaron." Before the end of this year production of this super fiber is to start up in Delfzijl and Emmen.

In the meantime a patent war has been raging for years now between DuPont and AKZO over the aramide fiber--a indication that the two artificial materials giants foresee large future markets for their super strong product. A recent court decision makes it look as though the American market may be closed to Twaron. According to AKZO, however, there is still enough of a market left over to make the development of the aramide fiber--which so far has cost AKZO some 600 million--profitable.

Aramide fibers have already been used in a wide variety of products that demand a combination of light weight and great strength. To name some examples: the bodies of racing cars, belts in car engines, conveyor belts, hawsers, hulls and sails for racing boats, aircraft, fire-resistant clothing, and bullet-proof vests (President Reagan is said to wear such an aramide vest constantly).

An interesting application is the use of aramide fibers instead of steel thread in radial tires. So far that has only been done for very expensive high-speed tires. However, large-scale use would open up a large new market for the new fiber. AKZO thus planned at first to set up its aramide fiber production in cooperation with tire manufacturer Goodyear. Goodyear, however, did not have the courage to take that step in the end.

Even Stronger

For aircraft materials it may also be possible to wed the aramide fiber happily with traditional aluminum. At Delft Technical University, Ir. [Engineer] Laurens Vogelesang and a few coworkers have recently developed a new material that consists of a sandwich of aluminum layers with aramide fibers glued between them. ARALL, as the material is called, is 30 percent lighter than aluminum of the same strength and stiffness. In addition, it offers much greater resistance to cracks due to material fatigue. Vogelesang received an important American technical award last year for his work, which had hardly been noticed in the Netherlands up to then.

A super fiber even stronger than the aramide fiber is the polyethylene, or PE, fiber recently developed by DSM. This will be marketed under the name Dyneema. Polyethylene is in itself an ordinary, not very strong artificial material used for plastic bags, pipes, boxes, and similar minor products. DSM researchers Piet Lemstra and Paul Smith have, however, succeeded in producing super strong fibers based on high-molecular polyethylene, which consists of very long molecules.

The long polyethylene molecules are unraveled in a solution, and the solution is spun. At that point the molecules crystallize into folded chain crystals that under very carefuly calculated conditions can be unfolded exactly like an accordian and lined up parallel with the direction of the fiber. This results in great strength and stiffness, exactly as Carothers had predicted in 1932.

The long polyethylene molecules owe their strength to the strong binding force between the carbon atoms they are built up from. Based on that carbon binding it had long been known that it must be possible to make a much stronger artifical fiber out of polyethylene. Theoretically it must even be possible to make a hyper fiber that would be 200 times stronger than its weight in steel.

Composites

In practice, however, there are limits to the length and precise direction of polyethylene molecules. The super fiber developed by DSM is 10 times stronger than steel and 1.5 times stronger than the aramide fiber. In addition, it is stiffer than the aramide fiber. It sounds unbelievable, but such a super fiber is strong enough to hoist up four men on a tiny thread one millimeter thick.

It appears therefore that the DSM fiber will compete directly with the AKZO and DuPont fibers, especially since it is based on an easily-produced raw material. A disadvantage of the PE fiber, however, is that it melts at 150 degrees, while the aramide fiber can stand temperatures of up to 300 degrees Celsius. That limits the uses it can be put to.

These super fibers can in most cases only be used optimally if they are held together in a connecting material, or matrix. Such a connector is usually some artificial resin. The combination is called a composite material. The strength of these composites depends to a large extent on the kind of artificial fibers they contain, how many fibers they contain, and above all what direction they run in.

Composite materials are unbelievably strong in the direction the fibers run in, but much weaker in the perpendicular direction. In that respect, they resemble old-fashioned wood. Builders have to take that into account. They do have much more freedom of course in doing so than the carpenter does. The fibers can be laid over one another in various directions. And you can calculate out exactly how and where various fiber directions can bear the load of an airplane, for instance. But Anthony Fokker did that with plain old wood. Without a computer.

12593
CSO: 3698/73

ADVANCED MATERIALS

MINISTER ANNOUNCES FRG MATERIALS RESEARCH PROGRAM

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 12 Oct 85 p 11

[Text] The intention of a program by the Ministry of Research to support materials research is to support science and industry to carry out research on and develop new materials. When the program was announced on Friday, Minister of Research Riesenhuber justified this increased initiative by the state, saying that the FRG had to become an international leader in the development of materials, as in the case of the classic materials, whether they were steel, alloys or plastics. The competitive ability of German industry was also crucially dependent on whether the proper materials were available at the right time. Scarce materials could also be replaced from almost inexhaustible sources of raw materials as a result of the new developments, and new areas of applications could be opened up.

Riesenhuber explained that the government was following its own path in providing state support with the program, for which DM 1.1 billion is being set aside in the research budget over the next 10 years. New materials could not be expected as the by-product of major projects, as was the case in the United States, and developments could not be pushed ahead as they were in Japan as the result of the interlocking of the state and industry through the Ministry of International Trade and Industry Miti. With his program Riesenhuber intends to provide support primarily for projects of the type in which science and industry cooperate more closely.

The areas of emphasis in the program are high-performance ceramics, powder metallurgy, metallic high-temperature and special materials, composite materials and new polymer materials. According to Riesenhuber's figures, the program extends over such a long period of time to allow long-term projects to be started. But every 3 years, an interim balance sheet would have to be presented.

9581
CSO: 3698/69

ADVANCED MATERIALS

BRIEFS

CERAMICS RESEARCH FOR TURBINES--The Eureka Program, initiated by France and favorably welcomed at the recent meeting of the heads of state in Milan, aims to respond to the technological challenges instituted by the United States and Japan and to permit a real technological renaissance of Europe. New materials figure among the five fields considered as decisive, side by side with data processing, telecommunications, robotics and biotechnology. The finaluzed priority program of action on materials was named EUROMAT and involves perfecting structural materials by the production of a high-efficiency industrial turbine. This turbine will involve various basic technologies: ceramic-metal bondings; ceramic-ceramic composites; behavior in corrosive atmospheres; fritting of complex shapes. The contemplated work program will be spread over 4 to 5 years and should associate both automobile industries and producers of materials. In France the partners could be Alsthom, Ceraver, Hospano-Suiza, Rhone-Poulenc, SEP, Turbomeca, Aubert et Duval, IMPHY, SNECMA, Framatome, Pechiney, Aerospatiale, etc. In Europe the partners could be: Great Britain: AME, British Ceramic Assoc., Harwell, Lucas, Rolls-Royce... Italy: Alfa-Romeo, Fiat... Federal Republic of Germany: BBC [Brown, Boverie et Cie], KHD [Klockner-Humboldt Deutz], MIU [Kraftwerke Union], Rosenthal, Technik. In fact, at the level of the involved sectors, we note the space program (shuttle), automobiles, turbomachines, aeronautics, but also terrestrial and mobile-terrestrial applications. [Text] [Paris COMPOSITES ET NOUVEAUX MATERIAUX in French July-Aug 85 p 1] 13112/9738

CARBONE-INDUSTRIE CREATED--As announced by Mr Desgeorges, president of Alsthom, before the general assembly of his Group, the creation of Carbone-Industrie is not official. A 50-50 affiliate of Alsthom and SEP, the new firm will manufacture and market Sepcarb, a carbon-carbon composite already well recognized by aviation and Formula 1 racins car stables. Carbone-Industrie, whose production unit will start up in January 1986 at Villeurbanne, will have a production capacity of 30 tons. This alliance should result in the high-speed train (TGV) being equipped with composite brakes, an interesting market and an excellent technological niche. [Text] [Paris COMPOSITES ET NOUVEAUX MATERIAUX in French July-Aug 85 p 4] 13112/9738

CSO: 3698/49

AEROSPACE

MBB, AERITALIA FOUND VENTURE TO PROMOTE COMMERCIAL SPACE

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 30 Sep 85 p 13

[Text] Bremen, 11 Sep--The company Intospace GmbH has been founded to use space as a laboratory and production site. This was announced shortly before the annual general meeting of the German Society for Air and Space Travel (DGLR), which takes place in Bad Godesberg on Monday. The founders are the Bremen space firm MBB-ERNO and Aeritalia in Turin. The statement announced that the new company's intention is to open up space for science and industry.

Intospace plans to develop programs and act as "promoter and intermediary" between space travel and industry. The range of services includes consulting and mediation in research, development and commercial production assignments in space, as well as marketing of lauch systems. The statement stressed that other companies could participate in Intospace GmbH as additional associates.

A spokesman for the company said that with the Texus, Spas and Maus projects and the reusable space laboratory Spacelab, the European space industry had developed and tested platforms which would allow the industry to work in space. The low force of gravity in space and the vacuum there were conditions which permitted a multifaceted spectrum of applications. This applied, for example, to the pharmaceutical and ceramics industries, semiconductor production and bioresearch, but particularly to metallurgy.

One of the services of the new company is to make available user rights for flights and experimental installations. In addition, the reservation, purchase and rental of space flights would be arranged and payloads assembled.

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CSO: 3698/69

AEROSPACE

ESA TO ADMIT FINLAND AS MEMBER

Helsinki HELSINGIN SANOMAT in Finnish 26 Oct 85 p 37

[Article: "Finland Gets Positive Response from European Space Agency"]

[Text] It is becoming more certain that Finland will also be admitted into the European Space Agency (ESA). The ESA board has decided to authorize the general secretary of the organization to negotiate with Finland about the conditions of associate membership. In Finland it is hoped that negotiations could begin already during November.

The meeting of the ESA board, which gave the Finnish dreams of membership the green light, was held at the agency's headquarters in Paris Thursday night. HELSINGIN SANOMAT was informed Friday by the headquarters that the board had decided to authorize the agency's general secretary, Reimar Lustin, to negotiate with Finland about specific conditions of associate membership.

The official notice of ESA's positive orientation toward the Finnish membership application had not yet reached the foreign ministry which customarily tracks such matters by Friday. According to deputy department head, Holger Rotkirch, Finland is ready to start negotiations quickly, by next month if necessary. The negotiators are named by the President of the Republic from the presentation of the foreign ministry and the final conditions of the membership are decided by the parliament.

Cost in Millions

During the beginning phase Finland is applying only for associate membership from which the shift to full membership will take place only after 5 years according to estimates. But even the associate membership is not without its cost. According to the report given to the government earlier this month the total expenses incurred amount upward to 3 million markkas, in addition to which the state is expected to participate in the funding of ESA projects.

Finland filed its membership application already in December. Those industries applying high technology, plus niversities and researchers are especially interested in the matter. The ESA membership is expected to generate orders for the industries, which would match 100 percent the expenses ESA would cause Finland.

ESA has numerous separate research and development projects the Finns are interested in at least in enterprises associated with information processing technology and distant imaging. ESA also has its own payload rocket Ariane, new versions of which are currently being developed. The Finnish enterprises, as far as it is known, are not greatly interested in rocket technology.

Last winter ESA also decided to participate with the United State's National Aeronautics and Space Administration, NASA, in the building of the permanent space station, Columbia. The agency's new major enterprise is above all an European space shuttle assiduosly pushed by France, although no definite decision concerning it has yet been reached.

Norway, Italy to be Full Members

The ESA board also decided in its Thursday meeting to approve applications for full membership from two of its hitherto associate members, Norway and Italy. Both countries have been associate members since 1981.

Two new members raise the ESA membership to 13. In addition the agency has a cooperation agreement with Canada.

ESA has nearly 1,400 workers on its payroll. Its annual budget exceeds five billion markkas of which France and West Germany pay nearly half and Italy and England together about one quarter.

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AEROSPACE

SUSPECTED FINLAND TECHNOLOGY LEAK HOLDS UP ESA APPLICATION

Stockholm DAGENS NYHETER in Swedish 31 Oct 85 p 12

/Article by Stefan Lundberg/

/Text/ Helsinki. Suspicion that Finland is leaking information classified as secret on space technology has delayed Finland becoming a member in the European Space Agency (ESA).

Reimar Lust, ESA General Director, stated in an interview with HELSINGIN SANOMAT that several member countries expressed their suspicions that Finland is leaking out information to the Soviet Union.

The talks on Finland's application for associate membership in the ESA were started around the end of 1984. But because of the lengthy procedure involved, it is thought that membership could not be made final until the beginning of 1987, at the earliest.

The Finnish government has denied the assertions that Finland would constitute a security risk. Lust made it understood that the government's clarification of its principles has alleviated suspicions inside the ESA. Among other things, the government has emphasized that Finland already has much American high technology that is restricted by export prohibitions to the East Bloc. Among other things, Finland has expressed some interest in being allowed to participate in the project involving the Columbus space station, which all 13 ESA member countries--except Sweden--have backed. And Sweden will probably join in soon, believes Lust.

Membership is ESA is a matter of vital necessity for Finland. All the large European countries belong except Portugal, Greece and Turkey--with these last three considered as technologically underdeveloped countries in Europe.

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CSO: 3698/124

BIOTECHNOLOGY

DETAILS ON BIOTECH PROJECTS DEVELOPED FOR EUREKA

Paris BIO LA LETTRE DES BIOTECHNOLOGIES in French July-Aug 85 pp 1-2

[Text] The Center for the Study of Advanced Systems and Technologies [CESTA] has developed the five main themes of the EUREKA program, one of which is EUROBIO for biotechnology. Two projects have been included therein, several points of which remain to be specified and in which the participation of industrial firms is still open:

Artificial Seeds

Nature of the Project: To create and to multiply a somatic plant embryo obtained by cloning, coated with reserves and an artificial membrane and whose presentation and use would be identical to those of present grains with enhanced qualities.

Inherent Benefits: Better selection. Creation of hybrid varieties freed from sexual reproduction. Transfer of genes modifying the cultural qualities (resistance to stresses, sicknesses, insects...). And the technological qualities (protein content, enzymes useful during processing...). Possibility of robotization of seed fabrication but also of certain portions of the subsequent processing.

Economic Spin-off: To give European firms the first places in the worldwide seed market (potentially 10 to 12 million dollars).

Organizational and Social Spin-off: Modification of the distribution of the tasks and the added values in the agro-food sector, restructuring and enhancing the agricultural profession at the European level. Transfer between industry and agriculture. In addition, the regulatory constraints for the use of enzymes and microorganisms in agro-food substances are becoming greater and greater and the proposed request would permit resolving toxicity problems by introducing in the plant, from the beginning, the catalytic function of technological transformation.

Base Technologies Involved: Genetic engineering applied to plants. Enzymatic engineering. Plant physiology. Embryo culture. Packaging. Biodegradable materials. Coating techniques. Dehydration technique not harmful to the environment. Final skinning technique. Perfecting bioreactors.

Contemplated Work Program: To associate some large laboratories and some large industrial firms in the scientific and agronomic field. Some small and medium-size businesses (biotechnology firms and fermenting firms) could also participate. Build up know-how in one or two varieties, the industrial use being then distributed among the participants.

Contemplated Partners in France-Industrial: Clause, Elf-Aquitaine, Claes--Luck, Limagrain, Rhone-Puulenc, Sanofi... - Public Organizations: CNRS [National Scientific Research Center], INRA [National Institute for Agronomic Research], universities (UT [Technical University] Compiegne, ISNA [National Institute for Applied Sciences], university laboratories...).

Contemplated Partners in Europe-Belgium: Plant Genetic System, SES [European Seed Company], University of Ghent..., Denmark: Denmark: De Dansk Sukker Fabrikker..., Great Britain: AFRC, Africultural Genetic Shell Nikkerson..., Netherlands: Royal Sluis..., Federal Republic of Germany: Hoechst, Institut Max Planck fuer Zuchtungsforchung (Cologne), KWS..., Switzerland: Ciba-Geigy, Sandoz...

Advantages of A European Corporation: The European teams are equal or even superior in ability to those of the North-American or Japanese teams but do not enjoy their cohesiveness, factors which determine success. Only European cooperation can permit emerging on the industrial level in time frames comparable to those of the American and Japanese competitors.

Control and Regulation Systems

Nature of the Project: Research and development programs on the problems of control and fine regulation that can be used for the micro-administration of medications or therapeutic products by devices implanted in man or for bioreactor controllers.

Inherent Benefits: Recent progress in the fields of the miniaturization of regulation electronics and the knowledge of ultra-fine biological parameters (hormonal dosages) as well as the necessity of mastering, in the field of bioindustries, multiple reaction parameters (operation of fermentators) requiring sensors and sophisticated regulation systems, lead to advocating the establishment of an interdisciplinary program which would unite electronics and control system specialists (and miniaturized control systems in biomedical engineering) with specialists in pharmaceutical products, in pharmacology and in clincs.

Spin-offs: New systems for administering medications, particularly those for which a regulated admission dependent on the biological parameters is necessary. Example: Implanted pump system whose output is regulated permanently by physiological probes (insulin-diabetes, hormones-growth)... New control systems for biological reactors permanently optimizing the bioreactional environment in order to permit obtaining the best continuous efficiencies.

Spin-offs for the health field are immense: Possibility of unlimited response to certain illnesses or insufficiencies... but also, in the field of health economy: smaller doses of therapeutic products, possibility of "decentralizing" the care... Spin-offs also in the field of bioindustries.

Base Technologies Involved: Biological and medical engineering. Electronics. Bioreactors.

Contemplated Work Program: To expand a design project with Siemens on the microadministration of medications by implanted devices. Design of sensors. Design of pumps and their control system.

Contemplated Partners in France: Elf-Aquitaine, pharmaceutical groups, pump manufacturing firms, perfusion.

Contemplated European Partners: Behring, Siemens, pharmaceutical firms...

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CSO: 3698/49

BIOTECHNOLOGY

AUSTRIA FUNDS BIOTECH, GENETIC ENGINEERING RESEARCH

Duesseldorf EUROPA CHEMIE in German 9 Jul 85 p 318

[Article: "Austria Funding Biotechnology--After a Late Start the First Priority Is the Development of Existing Facilities"]

[Text] In order to promote industrial biotechnology the Austrian Government has put into effect a technology emphasis program entitled "Biotechnology and Genetic Engineering." The funding budget of 200 million Austrian schillings, taken out of the resources of the Ministry of Science and Transport and also drawn from the research support fund, is to be available exclusively for Austrian companies. Applications are being immediately processed.

Of the total funding sum 40 million Austrian schillings alone are being supplied as a one-time financial shot to strengthen research capacities. Small and medium operations entering into biotechnology and genetic engineering can reckon on a maximum of 10 million Austrian schillings of funding per year and per project.

In this support program the foreground is occupied within the context of biotechnology by the development of cell cultures, fermentation technique, ore acquisition by means of microorganisms, together with associated plant and equipment. In genetic engineering the main items are the production of human hormones and of interferon in bacteria, and the microbiological production of vaccines and enzymes.

In the view of Austrian experts funding may also be available for the search for bacteria capable of consuming waste material or for the recycling of wood and woody materials. In business circles it is admittedly the general belief that as a late entrant into the field Austria would do better at first to concentrate on the further development of facilities and services which are already available together with associated physical plant. In the pharmacological sector it is being recommended that most attention should be given to the specialty market which exists for diagnostic materials and for analytic procedures. Two institutions are to be created in order to coordinate these activities. These will be the "Austrian Society for Biotechnology" and the "Austrian Society for Genetic Engineering."

As early as 1984, with the aid of the "Austrian Industrial Administration Company" (OIAG), a biotechnological institute has been founded by the state "Linz Chemicals Company" and an institute for basic research in genetic engineering. The people in Linz, in their new laboratory in which about 10 million Austrian schillings have been invested, plan to produce on a small scale new biological compounds and materials on a microbiologic basis and they will be working with plant cell cultures (compare EUROPA CHEMIE, No 34, 1984, p 584). The long-term goal is the development of biocatalysts for the synthesis of complex chemicals (in particular, for plant protective agents and pharmaceuticals). The institute would like to devote its work primarily to plant genetics and later perhaps also to human genetics and research into new diagnostic materials. It is expected that the number of its employees will increase within 3 or 4 years to about 100.

8008
CSO: 3698/41

BIOTECHNOLOGY

NETHERLANDS FINDS SUCCESSFUL APPLICATION OF 'MEMBRANE REACTOR'

Rotterdam NRC HANDELSBLAD in Dutch 21 Sep 85 p 13

[Article by Wubbo Tempel: "'Cheap Success': Collision of Membrane and Biotechnology"]

[Excerpts] Wageningen, 21 September--The greatest amount of progress often comes from a collision of two new technologies. This is the opinion of Dr Klaas van 't Riet, professor of scientific processes at the Wageningen Agricultural College. He has good reason to say so: a few of his recent research results have resulted from a happy marriage of membrane technology and biotechnology.

Van 't Riet will explain his proposition next week at the biotechnology seminars being held by the firm Alfa Laval.

The discovery by Van 't Riet and his coworkers is that they have combined two things that are normally separated. In an average biotechnological formation, a process takes place in a reactor whereby there results a stream of raw materials, products and often the utilized microorganisms or enzymes. These materials are seperated and purified in order to gain the desired end products. In this, membranes often come in handy. Membranes are porous and allow some materials through while stopping others. They are often put to use as small tubes.

Success

"Being the men of cheap success that we technologists are," Van 't Riet says, "we thought: Let's put the two things together. Things will certainly come out of it that we can use." The result of this thinking was a so-called membrane reactor. In all fairness, it must be said that an American, Alan Michaels, now professor at the Massachusetts Institute of Technology, had already set the idea afloat. Work is also being done elsewhere in the world, for example in the United States, France and Japan.

The first successful application was devised in Wageningen by Van 't Riet's coworker, Dr Piet Kerkhof. He wanted to use a membrane reactor for fat decomposition. He was in two different research groups, and this was the border area between the two. It was subsequently clear that not all

scientific work is difficult: "A half a day after we had the idea, the first test reactor worked."

The process technologists have in the meantime been working with the department of organic chemistry at the Agricultural College on an official project for decomposing fats. The work is in part taking place at the firm Rhenus in Veenendaal, which processes fats into fatty acids for the soap industry, among others; the company obviously derives a benefit from the new technology. The activities are being sponsored by the Ministery of Economic Affairs by way of the membrane technology innovation program.

Artificial Kidney

A simple artificial kidney serves as a test model for the membrane reactor. An artificial kidney of this sort is made up of a large number of thin cellulose tubes which are in turn housed in a plastic holder of approximately 5 by 20 centimeters. The kidney costs about 50 guilders and thus complies well with one of the starting points of Van 't Riet and Kerkhof: the membrane must be commercially obtainable. Otherwise it would quickly become too expensive for ordinary industrial application.

The kidney functions as a reactor because fat-decomposing enzymes, so-called lipases, are placed on the surface of the tubes. The idea did not come entirely out of the blue: Kerkhof knew that under certain circumstances, proteins become attached to the surface of the membrane. Normally that is in fact an undesirable polluting factor. The rest was now simple: oil was introduced along the outside and water throughout the inside of the membrane. Of the reaction products, the fatty acids wanted to return to the oil state, thus outside the membrane, while the other product, glycerol, sought out water. The reaction products were thus directly separated.

Generally speaking, Rhenus decomposes its fats at high temperatures, whereby moreover the reaction product, both fatty acids and glycerol, end up in the effluent. The advantages of the approach with the membrane reactor are thus evident: a lower cost because no heat is needed, and in addition a much purer end product.

In Japan, the enzymatic decomposition of fats is already being applied on a large scale. However, membrane reactors are not yet in use in Japan. But, Van 't Riet says, nor are they in use in the Netherlands. Van 't Riet says that in all honesty it must be said that there are disadvantages to the membrane technology. A membrane can become dirty or silt up, and much work is now being done to unravel the exact mechanisms of this.

But Van 't Riet sees that silting process as not being a fundamental obstacle for many applications. "Even if you assume that you have to replace a membrane every year, then with cheap membranes you are still not talking about a big investment. If you assume 50 guilders per membrane and you do not want to spend more than one cent per kilogram of product on the purification process, then you have to send no more than 5,000 kilograms through it. And that can be done."

Consequently, the possibilities are numerous. According to Van 't Riet, the membrane reactor lends itself in principle to any process by which large molecules are decomposed into smaller molecules. He gives as examples the decomposition of polysaccharides, which is often necessary in fining fruit juices, and the processing of starch. He estimates that in the long run a membrane reactor can be involved in up to 10 percent of all biotechnological processes in one way or another. Kerkhof is even more optimistic. He speaks of 25 percent.

12271
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BIOTECHNOLOGY

THOMAE OF FRG TO BEGIN PRODUCING GENETICALLY ENGINEERED DRUGS

Munich SUEDDEUTSCHE ZEITUNG in German 28 Aug 85 p 21

[Article: "Thomae Goes Into Genetic Engineering--Biotechnical Facility for 100 Million Marks/Business Satisfactory"]

[Text] xs. Biberach (In-House Report). This year and next year the Dr Karl Thomae Corporation, Biberach, will invest almost 100 million marks in the construction of a bioengineering laboratory. With this new installation the pharmaceutical enterprise, a member of the Boehringer-Ingelheim Group, will commence the production of bioengineering and genetic engineering pharmaceuticals in 1987. According to announcements made by management chairman Heinz Ried as its first product the company will manufacture the physiological substance PA produced by a partnership between Boehringer-Ingelheim and the Californian company Genentech, Inc, San Francisco.

According to Ried this substance is capable of dissolving blood clots without at the same time causing a general elevation in bleeding rate in the human organism: there have already been positive results obtained in treating acute cardiac infarct. In taking up this new production Thomae will increase the number of its employees in the coming year by 165 to a total of 3,245. There will be further growth in staff during the coming years.

Pioneer Research

In undertaking bioengineering production this firm which is included among the five leading pharmaceutical research entrepreneurs in the FRG is entering an area which in the words of Ried is "pioneer territory in which we must first learn to find our way." For this reason any prognosis as to the sales which this business will achieve "is not worth the paper it is written on." On the other hand the Thomae chief is quite certain that those imitators who do not conduct research will hardly be able to keep their footing in this field. He is referring here to those imitators who upon expiration of the "largely undermined patent protection" of commercially successful pharmaceuticals bring cheap imitation preparations into the marketplace. According to Ried "the bioengineering and genetic engineering business will be confined to those pharmaceutical enterprises which conduct research."

Up to now Thomae has been satisfied with this year's business. After finding that profits from pharmaceuticals for treating feverish colds were distinctly greater in the first quarter the firm reckoned, despite sales losses to imitators, that in 1985 they will have domestically an increase in sales by about 4 percent, of which about 1.5 percentage points will arise from price increases for medical preparations. The number of employees is said to have increased now by 75 up to 3,080. In 1984 Thomae was able to increase sales by 5.7 percent up to 553 million marks. Of this, 351 million marks (+3.8 percent) is from sales within the FRG. Thomae calculates that in the German drugstore market (here the pharmaceutical branch obtains 80 percent of its medication sales, the rest is in the clinic market) it will have a market share of 2.7 percent and thus take fourth place after Bayer, Hoechst and Ciba-Geigy. In export, which is handled exclusively through Boehringer-Ingelheim, Thomae made 139 million marks (+10.6 percent) from deliveries to parallel companies and about 63 million marks (+6.8 percent) in peripheral operations.

Parent Company Well Served

With its research and development efforts, which concentrated, inter alia, on medication against cardiac, circulatory and respiratory disorders, the company considers that it is clearly above average in the pharmaceutical field. Of the 2,830 employees (excluding trainees) in 1984 almost 890 were active in this area. The research and development expenditures amounted to 127 (compare 123) million marks. Considering that this cost is 23 percent of sales it is the opinion of Ried that Thomae is clearly above average among German pharmaceutical enterprises carrying out research--the average for them being 15 percent. In technical installations the enterprise invested almost 64 (50) million marks in 1984. The physical plant write-offs amounted to about 66 (30) million marks. The company's profits (there is an organic contract with the parent firm C. H. Boehringer and Sons, Ingelheim/Rhine) were, according to Ried, roughly average for the pharmaceutical industry. "Up to now year after year we have been shipping pots of money to Ingelheim."

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BIOTECHNOLOGY

FRG TO INVEST DM 1 BILLION FOR BIOTECH R&D THROUGH 1989

Dusseldorf CHEMISCHE INDUSTRIE in German Sep 85 pp 561-562

[Article: "DM 1 Billion for German Biotechnology]

> [Text] The federal government wants to invest more than DM 1 billion to promote biotechnology through 1989. As Minister for Research and Technology Dr Heinz Riesenhuber emphasized when the "Applied Biology and Biotechnology" research and technology program was adopted, the government is especially striving for close cooperation between the business world and science, so that new products can be brought onto the market as quickly as possible.

"The government's stimulation project should visibly advance basic research as well as economic and technological development along a wide front through combined action by departments of the federal government together with autonomous activities by the states," the minister said in Bonn. Since the requisite know-how for increasingly important biotechnology is in many cases available only in its initial stages, so that considerable delays could occur in introducing appropriate methods, Riesenhuber wants to stimulate cell culture technology, genetic technology, microbe technology, enzyme technology methods and bioreactor development in particular.

Priority Projects

The program (cf. tables 1-3) includes first of all institutional support and the stimulation of priority projects. As a national center for biotechnological research, the "Society for Biotechnological Research mbH" (GBF) in Braunschweig-Stockheim is to be fully developed as an institutionally supported large-scale research institution. The GBF is to be consistently strengthened in its function through staff consolidation and expansion of its infrastructure.

Long-term stimulation in the area of genetic technology at the genetic centers in Cologne, Heidelberg and Munich supports research work in the three large topics of main emphasis (gene structure, gene function and gene regulation) in current genetic and gene technological research.

The genetic center in Cologne (the Max Planck Institute for Breeding Research and the University Institute for Genetic Technology) is studying predominantly genetic questions in plants, while work at the Heidelberg gene center (the University, with the involvement of the German Cancer Research Center) is being done on virological and microbe-genetic questions and neurobiological problems, among other things. The focus of the research program at the Munich gene center (the University and the Max Planck Institute for Biochemistry) is the chemical synthesis of genetic matter and gene sequencing.

Analogous to the three gene centers, two main emphases in the area of basic research in bioprocess technology are to be developed; the planning phase for both projects has yet to be completed. However, one of them is already being developed; it involves an amalgamation of the Universities of Hannover, Braunschweig and Gottingen, with the involvement of the Society for Biotechnological Research.

Risks for Industrial Involvement Lessen

Secondly, there are plans to support theme-related joint research and--indirectly--better use of possibilities for applying biotechnology.

Industry's own forces are to be strengthened by backup support in the introduction of modern methods of biotechnological production and by a decrease in the risks in going over to the application of this technology.

Stimulation in the areas of cell culture technology, genetic technology, biotechnical processes with plant, animal and human cells and genetically altered microorganisms, processes of biological pest control, enzymatic processes for medical and food applications, machine and equipment development, as well as bioreactor development, including measurement and control technology for biotechnical and enzymatic processes, are thus to result after a procedure of application and approval geared towards widespread impact. The decisions by the individual companies concerning biotechnological product and process development are left to free competition.

Two phases are foreseen for the implementation of the stimulation program. A first phase serves to present and test the feasibility of the projected plan (preliminary phase). This is a basic precondition for the developmental phase. With this step, an appeal should be made to all legally autonomous companies in the above-mentioned areas. The non-repayable contribution amounts to 40 percent of the cost of the plan, as detailed below, however with a maximum of DM 600,000 per company. Contributions to several development plans by one company can also be granted, up to this limit. Appropriations can be made for the following expenses:

--Expenses for research and development personnel, including a flat rate for additional personnel expenses and other overhead (for example, DM 12,000 per man-month);

--Expenses for investments, insofar as economic goods valued at over DM 800 can be obtained; the allowance for stimulation in this is 25 percent of the total cost of investments; a higher allowance cannot be granted since both

compensation for remaining value and proportionate repayment of any investment bonuses are being rejected;

--Expenses for research and development jobs to third parties and external expenses for consultation within the framework of the development plan, including its preliminary phase.

Development plans proposed after 1 January 1986 can receive support.

The needed stimulation is estimated at approximately DM 100 million for a period of 4 years.

Table 1. Temporal Distribution and Breakdown of Federal Funding (in Millions of Marks) According to Stimulation Projects

Type of Stimulation	Is 1984	Should Be 1985	Estimate 1986	Financial Plan 1987	1988	1989	Totals
Institutional stimulation (GBF, EMBL, EMBC[1])	37.4	45.2	59.2	69.2	67.1	58.1	336.2
Gene centers and projects of main emphasis	14.3	19.0	24.0	26.0	32.0	37.0	152.3
Indirect measures	2.0	2.0	15.0	27.0	35.0	40.0	121.0
TOU[2]	0.7	2.0	3.2	3.8	3.8	2.5	16.0
Theme-related joint research:							
Microbe technologies, Genetic technologies	11.3	13.0	14.0	16.8	20.4	24.6	100.1
Cell culture technology	13.9	19.3	16.0	16.2	16.5	16.6	98.5
Bioprocess technology, Enzyme technology	10.6	14.0	18.3	21.8	33.5	42.2	140.4
New areas, cross-section activities	12.4	2.3	2.0	6.5	9.2	13.0	45.4
Research on plants and animals:							
--Plant breeding and regenerative raw materials	3.2	5.5	5.0	6.0	7.0	8.0	34.7
--Substitute methods for animal experiments; biological safety	5.6	10.0	18.6	19.9	20.4	22.6	97.1
Totals	111.4	132.3	175.3	213.2	244.9	264.6	1141.7

1. GBF: Society for Biotechnological Research mbH;
   EMBL: European Molecular Biology Laboratory
   EMBC: European Molecular Biology Conference

2. TOU: Technology-Oriented Business Foundations

Table 2. Genetic Technological Research Plans (As of 31 December 1984)

Institutions	Facilities	Genetic Technological Experiments	Teams
Universities	30	351	79
Max Planck Institutes	12	110	--
Research and Development Institutes (German Cancer Research Center, Society for Biotechnological Research, Nuclear Research Center, Society for Radiation and Environmental Research)	4	85	23
Industrial projects	11	54	--
Other (European Molecular Biology Laboratory, etc.)	4	82	--

Table 3. Production Value of Partly or Fully Biotechnically Produced Products (FRG, 1983)

Product	Value in DM Million
Human pharmaceuticals	14,020
Oils, fats, fatty acids	954
Vitamins	704
Hormones	357
Veterinary pharmaceuticals	242
Plant adhesives	239
Serums and vaccinations	225
Ethereal oils	218
Antibiotics	185
Gelatines	174

Source: Federal Office of Statistics, 1984

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BIOTECHNOLOGY

BRIEFS

CANADIAN BIOTECHNOLOGY RESEARCH INSTITUTE--The National Research Council's Biotechnology Research Institute (IRB), announced in April 1983, was created to serve as a center of excellence for industrially-oriented, generic biotechnology research. Its task is to ensure the rapid transfer of budding biotechnologies to existing or developing Canadian industries, in order to increase their productivity, their competitiveness on the internal market and their economic viability. The Institute will move into its permanent quarters, located in the Montreal scientific Cite, in March 1986. The total investment, including construction and laboratory equipment costs, is valued at 61 million dollars. With an annual operating budget of 25 million dollars, the Institute will employ around 220 people, incldding 100 degreed researchers and 120 technicians, and will be able to accommodate up to 80 researchers from industry, international organizations and universities. The Institute's current temporary quarters are in the Royal Victoria Hospital, where its scientists are carrying out their research programs in the following areas: biochemical engineering, genetic engineering, enzyme technology, cell fusion and molecular immunology. /Text/ /Paris BIO - LA LETTRE DES BIOTECHNOLOGIES in French Sep 85 p 4/ 9825/12228

CANADIAN BIOTECHNOLOGY SUBSIDIES--The Quebec Ministry of Science and Technology Higher Education has just awarded 12 subsidies, including one for biotechnology development, which will total between 1 and 1.5 million dollars over a 5-year period. The following sectors are involved: new, hormone-dependent cancer therapies (Molecular Endocrinology Research Laboratory, Laval University Department of Medicine, Dr Fernand Labrie, director); agricultural and forestry applications of plant and microorganism genetic manipulations (Laval University Department of Forestry and Geodesy, Mr Maurice Lalonde, director); immobilization of active biological material (Cell and Artificial Organ Research Center, McGill University Department of Medicine, Dr Thomas Chang, director). Moreover, this same ministry has decided to promote the creation of new, university research teams, to enable Quebec to catch up with its neighbors: the region has 1.94 college graduates per 100,000 inhabitants compared to 4.18 in Ontario. /Text/ /Paris BIO - LA LETTRE DES BIOTECHNOLOGIES in French Sep 85 p 4/ 9825/12228

DANISH SYNTHETIC GROWTH HORMONE--Deutsche Presse-Agentur--The Danish pharmaceutical firm Nordisk Gentofte has succeeded in producing, for the first time anywhere in the world, authentic human growth hormones (HGH) biosynthetically. The artificial hormone has in various tests behaved just like the growth hormone produced by the body, according to a spokesman for the firm. Production was successful with the help of DNA recombination technology, in which foreign gene material was smuggled into the carriers of genetic information in microorganisms, in this case colic bacteria. The growth hormone is being applied to the treatment of stunted and dwarfish children. Up to now the substance has been taken from the pituitary glands of deceased people. Nordisk Gentofte is planning to introduce the preparation on the market as early as 1986. [Text] [Solothurn CHEMISCHE RUNDSCHAU in German 13 Sep 85 p 3] 12271

FRG SCIENTISTS AGAINST GENETIC RESEARCH--Demanding an immediate stop to genetic research in all public and private research institutes of the FRG, early in June representatives of the biology departments of 20 universities and advanced schools in the Federal Republic have spoken out. During a national congress in Frankfurt the approximately 60 student deputies called in particular for a temporary stop to financial support for genetic engineering research projects. They gave as their reason the fact that no one can estimate the ultimate effect upon echo systems of the sudden emergence of a large number of artificially created organisms. [Text] [Duesseldorf VDI NACHRICHTEN in German 28 Jun 85 p 4] 8008

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CIVIL AVIATION

AIRBUS INDUSTRIE SALES HAMPERED BY U.S. TECHNOLOGY EMBARGOES

West Berlin TAGESSPIEGEL in German 1 Sep 85 p 17

[Article: "Airbus Industrie Is in a Bind--Because of an American Embargo There Can Be No Deliveries to Libya and Iran"]

[Text] Toulouse (dpa/VWD). Confirmed orders cannot be filled, new orders are not accepted. The sellers carefully avoid potent customers. That is the grotesque situation existing for the European Airbus Industrie in Toulouse. And all of this is only a consequence of the United States' embargo policy which forbids the American firms General Electric and Pratt and Whitney to deliver their power plants to Libyan or Iranian airlines. And to the East Bloc there have been no sales whatever. But for the Airbus Industrie there are involved in the meantime contracts in the billions--and no one knows any way out of the dilemma.

Originally the state-owned Libyan Arab Airlines ordered six "Airbus A-300" and four "Airbus A-310." Thus far it has not been possible to deliver any of them. As time passes the size of the contract is diminishing: from 10 to 8 to 6. Now there still remain four orders; they will eventually expire spontaneously. "We cannot fulfill our contracts. Neither do we know where we go from here," says Johann Schaeffler, the German general director and deputy president of Airbus. The long-term effects of this embargo policy are discernible: the Libyans urgently need new transport planes. If they are unable to buy in Europe or in the United States then they have no other course than to go to the East Bloc. At the same time the Airbus salesmen know very well that the managers of the Libyan airlines, which are conducted strictly in accordance with Western standards, fear nothing so much as having to buy Soviet jets.

No less constricted is the situation in Iran: at the present time Iran Airlines is flying five "Airbus A-300"; a sixth Airbus was kidnapped in Iraq and is now in Bagdad. Iran Airlines definitely wants to acquire more Airbuses. On the other hand this is opposed by the embargo policy of the United States. "We are literally fleeing Iranian ambassadors and politicians," asserts Schaeffler. Schaeffler is betting on the time factor and is looking for interim solutions during negotiations. The possibility of such interim solutions is not excluded: General Electric and Pratt and Whitney are permitted, for example, to supply replacement parts to Libya and Iran.

But a new cloud of problems seems to building up on the horizon. Since 1986 in the Western world strict noise abatement and environmental protection specifications have emerged which practically all traditional and technologically overage Soviet "Ilyushin" and "Tupolev" jets no longer meet. If in North America and Europe the new regulations are strictly enforced then it will only be the Soviet long-range aircraft "Ilyushin-62" which will be able to land in the West. On the other hand the Soviet aircraft industry is not in a position to supply the East Bloc airlines with modern jets either over the short term or middle term. And the Western aeronautical authorities will issue exception licensing to the Soviet jets only for limited periods of time, if at all. Schaeffler candidly admits: "There have already been conversations with eastern airlines."

8008
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CIVIL AVIATION

SUMMARY OF NEW TECHNOLOGIES ON AIRBUS A-320

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
2 Sep 85 p 7

[Article: "A Wealth of New Techniques for the Little Airbus A-320--Radical Changes in the Cockpit/New Power Plants/Synthetic Parts Cut Down Weight"]

[Text] khl. Frankfurt. The new transport aircraft Airbus A-320 representing the most modern technology and experience is expected to fill a market gap when it enters service in the year 1988. According to current estimates air travel will have grown by a factor of 2.4 by the year 2000--measured in terms of flown passenger-kilometers. Thus, presumably there will be a demand for more than 3,000 aircraft in the form of short-range and medium-range airplanes of the size of an Airbus A-320.

In contrast to the Airbus A-300 and the A-310 aircraft the A-320 will not be a giant airplane. This is apparent in its narrower fuselage. The A-320 is a "single-aisle" airplane which in its normal configuration provides only one aisle between the rows of seats.

For 140 to 180 passengers there is provided a fuselage cross section which offers more room in comparison with the Boeing and McDonnell-Douglas competing models. This extra space can be used both for seats which are 1 inch wider and also for a wider aisle. Passengers will be able to walk by the serving carts. The A-320 has a span of 33.91 meters, a height of 11.76 meters and a length of 37.57 meters. Its maximum takeoff weight is 66 tons, landing weight 61 tons, weight without fuel 57 tons, empty weight 37.1 tons and cargo 19.9 tons. Fuel capacity in the wings is given as 15,906 liters, freight capacity as 39.68 cubic meters. Mach 0.74 to 0.8 is listed as its optimal cruising speed; this corresponds to about 890 to 960 km/hr (naturally, this is on the basis of quite specific assumptions).

In the A-320 special attention has been paid to faster and more efficient baggage and freight handling. Fuel consumption per passenger is 25 percent lower and operating costs are claimed to be as much as 12 percent lower than for the currently best competing aircraft. In the A-320 advanced technologies are used which are unlikely to be surpassed even in later developments during this century. The systems are so designed as to be more reliable, so that errors can be quickly corrected and so that less maintenance is necessary.

Power plants are used which have a high induction current ratio. The power plants of the advanced CFM-56 type with 110 kilonewtons (11,200 kiloponds) of takeoff thrust contain much-tested components from predecessor models and thus provide great reliability and low operating costs. This is also true of the completely new IAE (International Aero Engines) V-2500 power plant. Both are controlled in a fully electronic manner by means of Fadec (Full authority digital engine control). Each of them costs close to $3 million. FAN blades are used. The "wide-cord fan" is a FAN having large profile depth. This is conspicuous especially in the V-2500 power plant. The blade is more rigid and thus its vibration behavior is better so that the so-called "snubber" can be dispensed with as can also the stand-off support and damping lug which are required for vibration damping in more slender blades; there are still traces of this in the FAN blade of the CFM-56-5 power plant.

Elimination of the "snubber" has the advantage that in this way one avoids flow losses that had been associated with it and in the middle portion of the FAN blade one obtains a very clean and easily calculated profile flow. The "wide-cord fan" must confront the problem of finding a design which at acceptable cost yields adequate strength and a lowest possible weight. A titanium sandwich construction has been selected. This yields blades which are both robust and low in weight. In addition to its large profile depth the FAN features a relatively small shaft diameter. This is also associated with another aerodynamic design feature: the hub area of the blades tends to produce greater pressure buildup. This is possible owing to the large profile depth. All in all, this leads to a smaller FAN diameter, namely 1.73 meters with the CFM-56-5 power plant and 1.6 meters for the V-2500.

In the two-man-crew cockpit the pilot in his seated position has good outside vision up to 21° downward and 21° upward and the wing tips are always visible on minimal head rotation. The new "Minidestick" control stick replaces the classical control column. It better exploits the possibilities available in the digital equipment and the video screen display. This optimal utilization together with the extensive integration of all aircraft systems makes possible a drastic simplification of the cockpit. The crew can work more efficiently, the weight of the aircraft is reduced and with improved error diagnosis maintenance becomes cheaper. Besides, fewer parts usually cost less money.

The Airbus A-320 is equipped with digital instruments of the second generation. These include the AFCS automatic flight control system as well as a reworked definition and complete integration of the computers, together with "fly-by-wire" and Fadec systems. These systems are less complex and this reduces both operating costs and the cost of replacing components. In addition, the weight of the equipment was reduced by about 50 kg. Also, operation by the crew has been made easier. In comparison with the DC-9-80 and the Boeing 737-300 the number of cockpit instruments has been reduced by a good 72 percent from 43 and 42, respectively, down to a bare 12.

By means of the "fly-by-wire" system the entire cockpit has been radically changed. Fly-by-wire denotes primarily nothing more than an electrical signal transmission of control commands. This leads to fewer mechanical parts, 40 percent less maintenance in the control system and 600 kg less weight. One

kilogram of less weight represents in the case of a large aircraft (although, to be sure, the A-320 is not such an airplane) as much as 120 kg less consumption of kerosene annually. Fly-by-wire in addition yields simpler automatic flight control as well as optimization of the controlled functions. It improves handling and permits an easier introductino of active control--in other words manual operation--which can still be used in an emergency to fly the A-320.

In the A-320 the entire secondary control system, namely flaps, slats and spoilers, as well as the primary controls in pitch and roll are electrically transmitted. Only the rudder actuation and the trimming of the horizontal stabilizer and elevator services are accomplished mechanically. However, the essential feature of fly-by-wire technology is the inclusion of a system of computers in the electrical signal transmission which thus involves digital data processing. The inputs in the form of control magnitudes are processed by flight control computers and transformed into corresponding control impulses. The autopilot is coupled to the system.

The wing technology tested in the Airbus A-310 also applies to the A-320. The wing surfaces of the latter each have a 122.4 square meter area and exhibit a 25° sweepback. A transonic profile with supersonic airflow on the upper wing surface yields greater negative pressure and higher lift. At the same time the A-320 wing is comparatively smaller. A special feature is the fact that the A-320 will be the first transport plane possessing mass-produced gust-load alleviation. This is achieved through symmetrical projections on the ailerons and on the two outside spoilers. This reduces the bending stress in the wings, especially in the region of the root of the wing. The wing root bending moment which is fundamental in the design of the structure has been reduced by 15 percent and this leads to a 180-kg savings in structural weight. The passengers' flying comfort has been improved.

In the case of the A-320 there has been from the outset a greater proportion of compound materials employed, especially including the use of carbon fiber-reinforced synthetics. In comparison with the light metal structures employed today such carbon fiber synthetic components offer 20 to 25 percent possible savings in weight and perhaps even 30 percent. There is no corrosion, the manfuacturing costs are relatively low and such structural components have high surface quality and contour accuracy. Up to now the use of such components had been limited to easily replaced secondary structural components--in other words cladding, spoilers, flaps and rudder parts. In the A-320 one finds for the first time primary structures made of carbon fiber synthetics. These are the horizontal stabilizers and elevators and rudders. Over the long term a "black airplane" is anticipated, manufactured completely out of carbon fiber-reinforced synthetics. But the development of combination materials is now in the second generation which includes carbon fibers and resins as well as compounds of these materials. They are more tolerant of damage and possess greater strength in resisting impact stress.

8008
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CIVIL AVIATION

PROBLEMS WITH ENGINE FOR NEW FOKKER 100'S

Amsterdam DE TELEGRAAF in Dutch 15 Aug 85 pp 1, 6

[Article by "our aviation editor": "Problems with Construction of Fokkers. Test Engines Fail"]

[Text] Schiphol, Thursday--Fokker is falling behind in the construction of two prototypes for new civil aircraft, the models 50 and 100. The Fokker 50 is to fly before the end of this year, and at Schiphol the rough forms for this successor to the Friendship will be pretty much ready when the wing is mounted next week.

This prototype will however not be a true Fokker 50, because too many parts are having to be borrowed from the Friendship.

The delay on the Fokker 100 is beyond the control of the factory itself. The most important safety test of the engines, the test of resistance against sucking in birds, was a failure. The rotor blades gave way under the force of three ducks that were shot into the intake during the test run.

The developers at Rolls Royce have been sent back to the drawing board and think they will be able to repeat the required safety test in October with an altered engine.

As a result of the technical set back at Fokker, USAir President Edwin Colodny has still not agreed to sign the contract for 20 Fokker100's nor the option for another 20.

To be sure he could get out of the agreement without loss, he would go no further than to sign a letter of intent for the Fokker product, without paying 10 percent down on the $380 million construction cost.

Fokker still has the fullest confidence in the Rolls Royce Tay engine. In one year's time the factory will receive two engines from Rolls Royce that will not be able to fly but will be able to carry out all tests on the ground. According to the Fokker construction schedule, however, the first Fokker 100 is to be ready for flight then.

Rolls Royce's manager for the Tay engine, Stan Todd, was surprised by the failure of the important safety test. The engine has already met all expectations.

At the test center in the English village of Derby, the bird collision test is carried out with specially bred ducks weighing around 3/4 kilogram. These are killed and immediately packed in a plastic bag and shot from a gun into the engine intake.

The power source then has to be able to keep on rotating for 30 minutes at 3/4 of its maximum power. The Tay engine, however, began to vibrate badly, and investigation revealed that the tips of the rotor blades were missing or bent.

The Fokker 50 is becoming more and more different from its 26-year old predecessor, the Friendship. Less than 20 percent of the parts are the same now. Under pressure from competing English and French-Italian aircraft that are to appear on the market at the same time, Fokker is striving for further innovation and weight-savings on the Fokker 50.

12593
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PROGRESS REPORT ON NEW FOKKER AIRCRAFT MODELS

Amsterdam DE TELEGRAAF in Dutch 16 Aug 85 p 3

[Article by "our aviation editor": "Fokker Personnel Working Overtime To Construct Prototypes"]

[Text] Schiphol, Friday--1600 aircraft workers are voluntarily working overtime four days a week for a month at the Fokker factories at Schiphol and Ypenburg to get back on schedule on the construction of the Fokker prototypes 50 and 100.

Fokker has had set backs in constructing the two prototypes, and the unions have agreed with Fokker to let the aircraft workers work 50 hours a week, including the free Saturday.

The unions have reached a tacit agreement with Fokker that the present staff of 9600 workers will be expanded to 13,000 within 2-3 years, given the success of the new aircraft that Fokker is getting ready.

Resistance

In addition, the English engine manufacturer Rolls Royce confirmed to Fokker yesterday that the engines for the Fokker 100 jet will be delivered on time, despite the unsuccessful test of the Tay engine's resistance to collision with birds. The Tay engine will be used in the Fokker 100.

Responding to our report from yesterday, Rolls Royce stated that there is no danger to production of the Fokker 100. The engine manufacturer is convinced that the first Fokker 100 will have its maiden flight on schedule, in June 1986.

Rolls Royce has already carried out a test with the Fokker 100's Tay engine, killing three ducks each weighing 3/4 kilogram, packing them in plastic bags, and firing them from a gun into the running test engine.

Blades

Contrary to expectations, the blades of the rotor were missing or bent. In October the test will be repeated with an altered engine, but according to Rolls Royce, this will not lead to delays in the delivery schedule, according to which Fokker is to receive two engines before the end of this year to carry out tests on the ground.

Yesterday Rolls Royce assured the first buyers that have ordered the type 100 from Fokker--Swissair, KLM, and USAir--that it will be possible to carry out test flights on time in June 1986.

12593
CSO: 3698/74

COMPUTERS

FRENCH MARISIS COMPUTER TO HAVE 200 MFLOPS POWER BY LATE 1980'S

Defense Ministry Financing

Paris ZERO UN INFORMATIQUE HEBDO in French 29 Apr 85 p 6

/Article by P. L.: "Inside the Eureka Project--Defense and Large Computers"/

/Text/ As the French Government announces Project Eureka, the Ministry of Defense assesses the progress of large French computers.

Recently the French Government proposed the startup of Project Eureka (European Research Coordination Agency). This project, which France would like to see adopted by all Europe, will coordinate research in six areas:

--optronics, which encompasses the fields of optics. The optical computer of the future, in which data would be processed not as electronic signals but as optical signals, illustrates what may now be called optronics;
--new materials;
--large computers;
--high-power lasers and particle beams;
--artificial intelligence;
--very fast microelectronics.

With its enormously large areas of research, about which the government has so far given few details, Eureka wants to be mostly a civilian project but with military applications.

If official sources are to be believed, Eureka should not be compared to the American SDI project (Strategic Defense Initiative, also known as "Star Wars"), a $26 billion project spread over 5 years and working more or less on the same lines. Eureka, certainly a civilian project, nevertheless remains at the center of the Ministry of Defense's concerns. In particular, the "large computers" part of it is of special interest to the military.

Indeed, Gerard La Rosa, chief engineer for armament, reminded us last week during a press conference that the development of the large French computers Isis and Marisis has its origin in the Ministry of Defense.

A French Machine

As early as 1980, the general delegate for armament was asking Professor Lions to rpopose the necessary steps to provide France with calculation capabilities equivalent to those available on Cray or CDC in the United States, or on Hitachi and Fujitsu in Japan.

At the end of this conceptualization stage, the group presided over by Professor Lions recommended the study of a French machine having a very high power (approximately 200 MFlops), to be available around 1987-1988.

As a result of this recommendation, the "large computers" program was incorporated into PAFE (Action Plan for the Electronic Branch) as early as 1981. It consists today of three parts placed under Colonel La Rosa's technical direction:

--Design of a basic machine (50 MFlops) assigned to Bull. Two prototypes should come out at the end of 1986. This is the Isis project.

--Design of a machine having a multiprocessor architecture carried out jointly by Sintra, ONERA /National Office for Aerospace Studies and Research/, CERT /Center for Technological Studies and Research/ and IRISA /Research Institute for Data Processing and Statistical Systems/. This is the Marianne project.

--Marisis, which brings together the Marianne and Isis projects, should finally create a supercomputer running at a speed of 200 MFlops.

A Project at the Halfway Mark

The total budget should reach some Fr800 million between 1981 and 1987. Today (see table) this project has almost reached the halfway mark and practically all the financing has been done by the Ministry of Defense.

Financing of the "Large Scientific Computers" Program
(in millions of current francs)

Years Organizations	1981	1982	1983	1984	Total
Ministry of Defense	15	75	103	80	273
General Directorate of Telecommunications				30	30
DIELI /Directorate of Electronic Industries and Data Processing/			13		13
Ministry of Research & Technology				10	10
Total	15	75	116	120	326

Source: Ministry of Defense

Isis Integrates Current Technology

Paris ZERO UN INFORMATIQUE HEBDO in French 29 Apr 85 pp 6-7

/Article by P. L.: "The Large French Computer Project--Isis' First Steps"/

/Text/ The Isis machine, the leading unit of the French Marisis supercomputer project, has been assigned to Bull. The Ministry of Defense announces its specifications.

To provide in 1986 a vector machine doing scientific computations at a speed superior to 50 MFlops: this is the task that was assigned to the Bull group, assisted by ONERA /National Office for Aerospace Studies and Research/, CERT /Center for Technological Studies and Research/, INRIA /National Research Institute for Data Processing and Automation/ and IRISA /Research Institute for Data Processing and Statistical Systems/.

Today, this machine, which has been given the name of Isis, is taking shape. Its general architecture has been decided. Isis will form a multitask system that will allow the simultaneous processing of four programs. It will hold a three-level memory sequence, a scalar processing unit and a vector processing unit with a high degree of parallelism.

Isis should not cause new technological developments but rather integrate existing products: LSI /Large Scale Integration/ circuits from Siemens (ECL technology) and MSI circuits from RTC /Radio Technique Compelec/. Moreover, Isis should be modular for its memory capacity as well as for its vectorial power. Finally, let us point out that Isis will process 64-bit bytes, a size necessary for the accuracy of scientific computations. On the whole, Isis' architecture is comparable to that of the new Fujitsu vector processors.

Three Levels of Memory

The memory sequence indeed spreads over three levels.

First level: physically, the main memory consists of 16 separate sectors in an intertwined structure. The cycle time for each sector is estimated at 60 ns. The overall output is fixed at approximately 2 billion eight-bit bytes per second. Capacity is limited to 8 Mbytes.

Second level in the sequence: the secondary memory. It has a large size (up to 100 Mbytes) and an output identical to that of the main memory; it is used as an intput-output storage.

Finally, last level: the mass memory on fast disks. With a size of at least 4 billion eight-bit bytes and a maximum output of 100 M eight-bit bytes per second, Isis' mass memory should optimize the loading and unloading of programs for one application.

As far as processing itself is concerned, the scalar unit controls program implementation, since this is the unit that manages the search for instructions

and their decoding. It processes the instructions prepared for it and subprocesses vector instructions. The scalar unit can process simultaneously 4 programs, each having access to private or shared resources: specific arithmetic and logic units, storage memory of 256 instructions for an anticipated loading and for the preparation of branchings. A group of 256 general registers is included in the scalar unit.

A prototype is planned for the middle of the year 1985.

Basic Processors

Depending on configurations, the vector unit will consist of 8 to 32 basic processors, of which scale models have been made since 1983.

Equipped with work registers, the vector unit performs floating-point arithmetic operations, conversion operations from integer to floating point or vice versa, or also integer-arithmetic operations.

To manage all the basic processors, the machine uses a central sequential processor. Only one vector operation may take place at a given time but the sequential processor can transmit several "vector models" simultaneously to a storage memory. The term vector model refers to a sequence of transfer operations from the memory to the processors or vice versa, carried out at the same time as a sequence of operations on the registers.

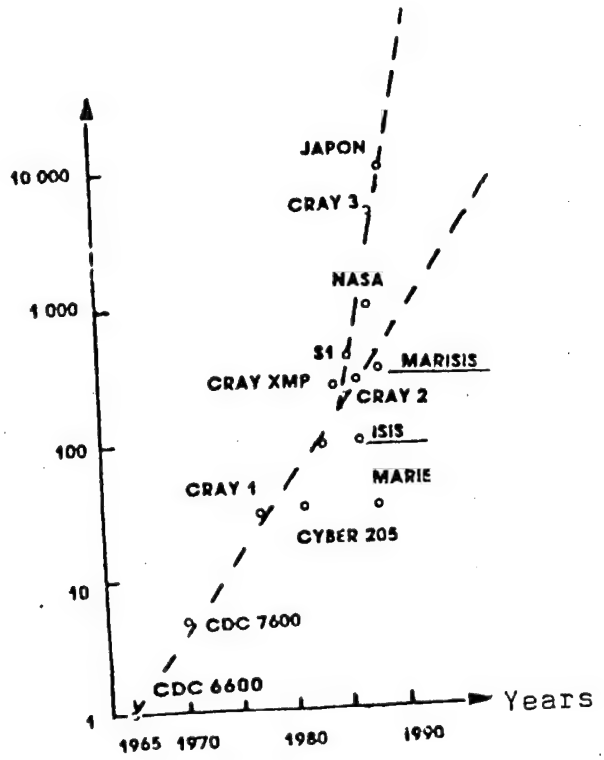
It has been mentioned that Isis will have few peripherals for communication with the outside world. The users' consoles will be connected to a frontal machine that will perform pre- and post-operations.

As for software, Isis should be equipped with a multiuse and multitask operating system. This system will use all the capabilities provided by the hardware, particularly segmentation and protections. The first software tolls available to the user are: a vector macro-assembler (which should be completed in 1985), a Fortran 77 compiler with vector extensions, a precompiler with automatic conversion into vectors and a basic mathematical library.

Finally, let us recall that ultimately, at the end of the 1980's, several Isis machines--two at the beginning, increasing progressively to seven--should be integrated into a multiprocessor architecture (Marianne) to give birth to Marisis, the large French computer, whose real power is now targeted at approximately 200 MFlops, greater than Cray-XMP. But by that time, the Cray 3 and the Japanese computers should have reached powers of several thousand MFlops....

Relative Powers of Supercomputers

Power in MFlops



Source: Ministry of Defense

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CSO: 3698/86

COMPUTERS

SIEMENS SELLS JAPANESE-BUILT 'MOST POWERFUL' COMPUTER

Landsberg PRODUKTION in German 11 Jul 85 pp 1,2

[Text] Europe's most powerful computer was officially put in operation on July 4 at the IABG in Ottobrunn. The vector computer VP 200 manages 533 million floating-point operations per second. The areas of employment of the 20-million-mark-monster extend from strength studies to picture data processing and numerical crash situations as carried out previously in collaboration with the Bavarian automobile industry.

"As a pure service enterprise our computer output is available to all clients from the state, science and industry," says Prof. Dr. Johannes Dathe, engineer and manager of the Industrieanlagen-Betriebsgesellschaft, for short IABG. These clients come increasingly from the free economy. Nevertheless, the state and there primarily the defense ministry, are with approximately 60 percent the largest customer of the Ottobrunn enterprise. The new super-computer of the IABG is to be utilized, however, to a great extent for industry because with its almost crazy performance of 533 megaflop--i.e. millions of floating-point operations per second--it offers a good base for flow calculations, strength studies, graphic applications or simultations, as have already been carried out in collaboration with BMW. This involves the simulation of crash tests of automobiles. Applications can even cover such areas as environmental protection by determining the spreading of contaminants. Although the computer was delivered by Siemens, it was built by Fujitsu. Besides in Japan, there is only one computer of this type in the world, namely at the American Amdahl company. Already now, however, the development of a still more powerful successor, the VP 400, has been announced. "The VP 200 is presently the most powerful unit on the world market," confirms Dr.-Ing. Werner F. Poschenrieder, a member of the Siemens Board of Directors. "We want to contribute with this product and suitable applications to advancing us further to the top in this race for high technology." According to Dr. Poschenrieder, it is contemplated at Siemens to venture construction of such a computer giant with the participation of other European enterprises. "I estimate the worldwide demand for such computers to be 20 to 30 units annually," he stresses, "but this demand for vector computers will very soon increase ten-fold."

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NORSK DATA VICE PRESIDENT ON COMPANY PHILOSOPHY, STRATEGY

Rotterdam NRC HANDELSBLAD in Dutch 6 Sep 85 p 10

[Article by Zeger Luyendijk: "Norsk Data Grows Steadily in Europe. 'Without a Cooperative Agreement You Get No Government Contract in France' "]

[Text] Rotterdam, 6 Sep--The Netherlands has another computer company: Norsk Data. Not an American company, but rather--and this is what is special about it--a firm that was founded 18 years ago in Norway and that has slowly but surely made a small place for itself in Europe since the start of the 1970's.

Norsk Data is one of the few successful attempts in Europe to build computers and to keep on building them amid the combined competition of the American computer industry. "It is only in the last 7 years," says Lars Gahnström, Norsk Data's vice president for marketing, now visiting the Netherlands on the occasion of the opening of the firm's first official branch in the Low Countries, "that we have realized the importance of service and marketing. At first we thought that a good product would sell itself. However, it takes a lot more than that. More than 60 percent of our personnel are now involved in marketing. For the first 10 years we were primarily technically oriented."

Norsk Data was founded in 1967 by three Norwegians who had fiddled around for years in the Massachusetts Institute of Technology laboratories. The computer fever then raging (and still raging today) in the area around Boston--better known as Route 28--infected them too, and that led them, along with some other enthusiastic Norwegians, to found Norsk Data mainly with the idea of developing a medium-sized minicomputer. "It was founded at the same time as other Boston-area firms like Prime and Data General, all builders of minicomputers, which was the big innovation in those days."

Knowledge

The difference from those firms, Gahnström explains, was that Norsk Data did not have a policy of keeping costs as low as possible, as the American firms did. "The American firms think in terms of high volume. Europe was not nearly so large a market, and so Norsk Data decided to take as much advantage as possible of technological progress. That made our computers, which were full of the latest tricks, so to speak, more expensive to be sure, but it also made programming costs lower. Where certain functions had to be programmed separately for other computers, with us that function came already built in, thanks to the technology."

The technical tricks inside the Norsk Data computers led to a breakthrough for the firm in 1973, when the European Cern [European Commission for Nuclear Research] particle research laboratory in Geneva put in a large order. "We left the Americans behind," Gahnström says with a smile. "That order helped us immensely."

In Europe, Gahnström says, people were too inclined to believe that only large companies could build computers, and that any attempts to build them would founder because you could not find trained people. "That is all nonsense. Europe is the cradle of many inventions in cybernetics, and so of course you can find the right people. Even in Norway, because with educational possibilities in informatics, for instance, so limited there, many Norwegians go abroad to study," Gahnström says.

"Furthermore, the chances of success are much greater if a project is carried out within a small group of people, and you really do not need a large firm for that. In Norway we have the relative advantage that academically trained people are less expensive than blue collar workers, for instance. Further, American firms have a personnel turnover of 20-30 percent. Norsk Data has a turnover of only 5 percent. And of course we have had an awful lot of luck."

Matra

Right after the breakthrough in Switzerland, Norsk Data established a foothold in other countries, starting with France, followed by Sweden, Great Britain, and later Germany too. In India the firm is engaged in discussions which Gahnström says are far along. In France Norsk Data signed a distribution and cooperation agreement last year with Matra, the electronics company. "We were forced to do that," Gahnström says, "since the French authorities would forbid any possible government contract because we were not a French firm. Government-related contracts must be 30 percent of the total in France. Public sector automation is a strong point of ours."

However, the cooperation with Matra is certainly not working out to Norsk Data's disadvantage. "They have very good technology in France, and so we included a clause on research and development in the cooperation agreement. Matra has very fine people in the chip development field, and we will share in the benefits from inventions there."

Eureka

Through Matra, Norsk Data has gotten into the Eureka plan to stimulate technology in Europe. The Norwegian-French venture has dealt itself in with a project to develop very fast computers. "Taking part in Eureka," Gahnström says with a twinkle in his eye, "does not mean that we would never have developed that fast computer otherwise. It would certainly have come to that. For us the fast computer is a sound business decision, because whatever there is a demand for we will develop. For us Eureka does not not make much of a difference, and for Matra it does no harm to say they are going along with it. In France everything is political after all." Norsk Data is also doing research in the area of artificial intelligence with the British firm Racal.

Gahnström says he expects a slump in the computer industry in Europe, like the one in the United States. "But we are still very small, and so there is still breathing room for us. Many firms are using the slump to hide internal difficulties, bad decisions, and so on, but we have to remain aware that a slump may come. One advantage is that we do not manufacture for inventory, the way the personal computer industry does. We produce as much as we have orders for. As long as we are aware of the dangers, there will be no problem."

12593
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COMPUTERS

ERICSSON INFORMATION SYSTEMS CUTS PERSONNEL, EXPECTS LOSS

Stockholm DAGENS NYHETER in Swedish 4 Oct 85 p 10

[Article by Bjarne Stenquist]

[Text] Ericsson Information Systems (EIS) is reducing its personnel from 22,000 to 20,000. The reduction will occur through natural attrition, and it is the consequence of the austerity program that DAGENS NYHETER reported yesterday.

The decision will affect 1,000 people in Sweden and 500 in the United States. In all, 1,200 salaried employees and 800 hourly workers will be affected.

In addition, a 3-day week is being introduced at the plants in Barkarby and Linkoping. It will last 3 months and affect about 600 people.

Stig Larsson, managing director of the EIS, says: "The cutbacks will occur through natural attrition and recruitment for other divisions in the Ericsson Group. The exception is the United States, where we will lay off employees."

Large Inventories

The EIS expects to save from 500 million to 600 million kronor annually as a result of the personnel cutbacks.

Stig Larsson says: "The reason for the 3-day week is that we have large inventories of some products and components. The original plans called for selling 70,000 personal computers per year, and we are now up to about 25,000. This means that we laid in too high an inventory of components."

Stig Larsson says: "But the production of personal computers in Brakny-Hoby will resume as soon as we use up the current inventory, and that will happen around the start of the year."

The purchaser of Ericsson's furniture manufacturing activity in Atvidaberg is Design Function, Inc., a company in Malmo.

No Profit

Stig Larsson says that the weak market for personal computers and the fiasco in the United States have cost the EIS "several hundred million kronor."

The result is that despite heavyhanded economy measures, the company is not going to show a profit this year, either.

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COMPUTERS

BRIEFS

DM 6 MILLION FOR BERLIN MEMBRANE RESEARCH--All functions of the human body such as respiration, digestion, or muscular motion occur in the extremely thin membrane which surrounds every biological cell. In order to track down more precisely this elementary life process, the German Research Association created the special research area 312, "Directed Membrane Processes." By 1987, about 6 million marks are to flow into this interdisciplinary project. The participants are physicists, chemists, and biochemists of the Free University, Technical University, and of the Fritz Haber Institute of the Max Planck Society in Berlin. One could expect that the charge separation occurs in the first nanosecond and that, in the next nanosecond, the two charges are again reunited. However, such is not the case in biological reactions. The forward reaction takes place very quickly, about in 1 nanosecond. The backward reaction is about 100,000 times slower, which means it takes hundreds of microseconds. Since the charge transport is directional, the result is a membrane that is charged negatively on the outside and positively on the inside. This directionality in chemical reactions is achieved by imbedding the reaction systems in complex proteins. The structure of the membrane proteins and the processes at these membrane proteins are analyzed in the special research area. Its main objects are the chloroplast membrane, the membrane of optically active bacteria, and of receptors and pulse generators at the nerve ends. Furthermore, one tries to develop molecular machines from extremely thin synthetic membranes. This can be done without protein, if it is possible to produce membranes which have a different charge inside and outside. For this purpose, oily water-insoluble molecular structures are equipped at their two ends with two head groups that are water soluble and that are of different sizes. Under suitable conditions, these molecules can be assembled to form spherical membranes (vesicles). Such nonsymmetric membranes are a first step towards the design of artificial systems, which can perform directed membrane processes. One day they will utilize sunlight, will directionally transport drugs, and will be able to influence nerve reactions. /Excerpts//Solothurn CHEMISCHE RUNDSCHAU in German 3 May 85 p 16/ 8348

EUREKA 64-MB CHIP--The joint European research and development program Eureka is also supposed to help the European semiconductor industry to accomplish a a technical breakthrough success. This involves the development of the 64 MB chip. For this joint development, Philips, Siemens, Bull from France, and the

British General Electric group have collaborated together. The 64 MB chip represents a developmental jump, such as previously has been hard to imagine. At this time, the step from the (dynamical) 64 KB to the 256 KB chip has just barely been accomplished. Now it appears as if the 1 MB chip is already establishing itself on the market, before the 256 KB chip has even somewhat amortized itself. At any rate, the first samples of the 1 MB chip are already running around in the Japanese computer industry. But from this microchip to the 64 MB chip, the road leads over two major stages, the 4 MB and the 16 MB chips. Just the transition from the conventional 256 KB to the 1 MB chip surely will cost the Japanese and non-Japanese enterprises engaged in this area more than the equivalent of 1 billion DM. Since the development costs presumably rise discontinuously with the memory capacities, however, one must start from the idea that substantial amounts in the billions are involved within the framework of the Eureka program for the 64 MB chip. At least from the present perspective, this chip may represent the final stage of a long line of development. /Text/ /Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 27 Aug 85 p 6/ 8348

EC OPTICAL COMPUTER FUNDS--Within the framework of an EEC plan intended to stimulate European cooperation in the area of science and technology, the EEC Commission has with just under DM one million created an international amalgamation. It involves 19 scientific teams at 18 universities and research institutes. The goal is the development of an "optical computer." [Excerpts] [Solothurn CHEMISCHE RUNDSCHAU in German 13 Sep 85 p 20] 12271

CSO: 3698/11

MICROELECTRONICS

SIEMENS PURCHASE OF TOSHIBA 1-MEGABIT TECHNOLOGY DISCUSSED

Rotterdam NRC HANDELSBLAD in Dutch 4 Oct 85 p 9

[Article by Wubbo Tempel: "Siemens, Without Toshiba Megachip Would Have Arrived Too Late"]

[Text] Munich/Regensburg, 4 Oct--If Siemens had not signed an agreement with the large Japanese chip company Toshiba, it would have come on the market too late with its 1-megabit dynamic memory chip. Only by taking over production technology from Toshiba has Siemens been able to speed up even the original highly ambitious plan for its mega-project. That was necessary because the Japanese competition too has sped up its development.

Dr. Hermann Franz, a member of the Siemens management council, said that yesterday. As head of the Components Division, Franz is responsible for the mega-project, through which Siemens, partly through cooperation with Philips, wants to catch up in the area of chip technology. The cooperation between Siemens and Philips is often viewed as a last effort by European manufacturers to keep themselves in the battle for the world chip market.

For Siemens the mega-project consists of developing the 1-megabit dynamic memory chip and--together with Philips--the next generation of 4-megabit dynamic chips. Philips itself is working on the 1-megabit /static/ [italicized in original] memory chip, which in terms of difficulty is comparable to Siemens' 4-megabit chip.

When Franz was asked whether the mega-project was still on schedule, he replied: "Let me answer that question by pointing to our cooperation with Toshiba." The initiative for the agreement by the way came from Toshiba, Franz said.

According to Franz, Philips is also speeding up its part of the program. He said that at the moment Philips is carrying out talks on possible cooperation with a Japanese firm. It may be that Siemens is currently putting some pressure on Philips. Franz said that just yesterday Siemens people were at Philips to "discuss this matter."

Brought Forward

The original plan for Siemens' 1-megabit has now been brought forward by 1 year. Franz: "Because of the shrinkage of the chip market, our Japanese competitors have sped up all their research and development. Our original plan, whereby we wanted to have the 1-megabit chip in mass production at the end of 1987, would simply have been too late."

Thanks to this speed-up in the plan, the chip is now to be on the market "in the middle or at the end of 1986." The only way to accomplish this was to sign the cooperation agreement with Toshiba; that was made public in July. Siemens paid an unannounced sum and in return receives a cross license from Toshiba. The Japanese firm supplies the production technology for the 1-megabit chip and receives systems technology from Siemens.

The great advantage of the cooperation for Siemens is that the firm does not itself have to put any extra researchers to work on the 1-megabit project. That means that the development of the 4-megabit chip can go ahead undisturbed and will "obviously" be sped up by the faster arrival of the 1-megabit chip.

When asked whether Siemens is not afraid that Toshiba will also get away with technology for the next generation of chips, Dr. Beinvogel, project leader for the 4-megabit part of the project, responded by simply pointing to Siemens' present "backwardness." Toshiba has little to gain in this, Beinvogel seemed to be saying.

Memories

Through the mega-project Siemens, partly through cooperation with Philips, wants to catch up technologically with the Japanese and the Americans. In their plans the firms have chosen to throw themselves into the development of memory chips, although neither of them is now particularly strong there. But memory chips are the simplest in structure and are thus the first to be produced with a new, complex technology.

Thus new generations of memory chips are constantly coming into being, named after the amount of information they can store. For producers the important thing is to be the first on the market with a new generation. Once there is a large supply, prices fall quickly and with them the chance to make profits. Dr. Gernot Oswald, head of Siemens' Semiconductor Division, illustrated that from the market for the generation of memory chips that can store 64K bits (over 65,000 units) of information. The Japanese firm Hitachi, which got there first with the 64K, made more profit this year on those chips than all its U.S. competitors together had in sales.

Siemens does not actually have to be the first one on the market with its 1-megabit dynamic chip, Dr. Oswald said. The goal is to be one of the first five, because they can make hefty profits. Numbers 6-10 should not count on doing so. "And I know what I am talking about," said Oswald, referring to Siemens' past experience with memory chips.

It was noteworthy that as possible competitors Oswald only mentioned the Japanese concerns Hitachi, NEC, Fujitsu, and Toshiba, hardly referring to American companies. It is only AT&T that might still be in the running.

Franz too did not show any concern over periodic reports that an American company has displayed a prototype for the new generation of memory chips. (In the U.S. trade press there are regular reports that IBM, AT&T, and other companies have gotten that far.) Siemens is taking only the Japanese competition seriously, because they are the ones that can actually put the chip into production in far and away the most efficient manner. Siemens itself will "certainly not be the first," Franz said. At present the company still has no protoype to show.

When asked whether Siemens will really be able to earn back the costs involved in developing the new chips, Franz said that was "a very good question."

The "central innovation" is that the chip will be three-dimensional. Up to now the circuit plan has consisted of relatively flat plates of material laid over one another. The plates might be 2 microns deep and 10 wide. But because the measurements are growing smaller, there is no longer any room for such a construction. Therefore, to take an example, condensors that store a charge on a chip will become deeper. They will only be 1 micron wide and 10 deep. This principle was invented in 1983 by Hitachi. Siemens and Philips have acquired patents for that.

In the meantime new buildings are going up at the various Siemens installations in Southern Germany. The headquarters in Munich-Perlach is getting a new chip center and a building where the manufacturing process for the new chips is being tested.

In Regensburg, east of Munich on the Danube, Siemens is building the factory where 1-megabit dynamic chips are to be produced starting next year. Siemens chose Regensburg because it already had an installation there with empty land available, and because it is possible to construct a reasonably vibration-free building there. Vibrations, as from the Munich subway, can cause serious difficulties in chip production.

Dust will do the same thing. The room where chips are produced must be just about absolutely dust-free. Of the more than DM 500 million being spent on the Regensburg factory, more than half is being spent for air purification in the plant. A group of Philips engineers took a look at Regensburg not long ago to see how that is all being approached. According to Siemens, this is another example of technological cooperation.

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MICROELECTRONICS

COMMENTARY ON SIEMENS-PHILIPS MEGABIT PROJECT

Amsterdam DE VOLKSKRANT in Dutch 5 Oct 85 p 33

[Article by Broer Scholtens: "On the Danube, Europe Gets Its Last Chance"]

> [Excerpts] In Regensburg, some 150 kilometers from Munich, something nice is due to happen in the next few years. It is there that the European chip industry is to catch up in technological development so as to be back in the race by the end of the 1980's. Broer Scholtens traveled to the Bavarian Silicon Valley to take a look there at the tiny details on a square centimeter of silicon.

On an industrial site right on the long since not-so-blue Danube, the German electronics firm Siemens is building a chip factory where the first large memory chips are due to come off the assembly line as early as next year. This will be the 1-megabit DRAM, a fast memory chip with one million components on an area of less than one square centimeter.

In the race to produce this 1-megabit DRAM Siemens is still a few months behind its mainly Japanese competitors such as Fujitsu and Toshiba. However, Siemens, in cooperation with Philips from the Netherlands, is working to catch up. Technologically next after the 1-megabit DRAM is the 4-megabit DRAM, a memory chip that is four times more compact yet. It is with that chip, the technology for which Siemens is developing together with Philips, that the two European manufacturers hope to fight their battle at the end of the 1980's.

The European concerns were always trudging along behind developments until a short time ago. It was always 1 or 2 years after other firms had brought their new generation of memory chip on the market--and therefore 1 or 2 years after they had the technological knowledge required--that West European firms would follow. The agreement reached in May of last year between Philips and Siemens is intended to change this.

Megabit Project

Through this project, European industry is supposed to "get back in the race" at a single blow around the end of the 1980's, once again to be in step with Japanese and American industry. For this megabit project the two firms have together earmarked 3 to 4 billion guilders. The goal is of such interest that both the Dutch and the German governments have earmarked another half billion guilders for it.

In this megabit deal between Philips and Siemens, it was agreed that Siemens will work on developing the submicron technology necessary to manufacture the 4-megabit DRAM, a dynamic memory chip suitable for products such as computers and telecommunications equipment, where fast switching is essential.

Philips is using its expertise to develop the somewhat slower 256 kilobit SRAM, a static memory chip. This has one fourth the memory capacity but is more complicated to produce. This SRAM, which Philips is interested in because SRAM's can be used in various new or improved consumer goods, calls for the same technology as does a 1-megabit DRAM.

For this megabit project, which calls for complete exchange of knowledge about submicron technology, new developmental laboratories are being built both in Eindhoven and in Munich. At the beginning of next year they will be able to start the research and development work there. The production centers for the chips will be built around the end of the 1980's in Regensburg and Nijmegen.

It was originally intended to have these large memory chips with their submicron technology in production around 1989. Recently however that date has been brought forward. Siemens wants to have the 4-megabit DRAM in production already in 1988 for competitive reasons. It is only in that way that it can keep up with the Japanese firms in particular, Siemens feels.

"This megabit project is Europe's last chance in the competitive battle against the Japanese chip invasion," says Dr. Hermann Franz, the man at Siemens behind the megabit developments. "If we in the chip industry do not enter the age of submicron technology at the same time as the Japanese firms in particular, then we will not survive the next decade."

In order to achieve that speed-up in the megabit project, Siemens will be investing extra money and manpower in the next few years. Both are scarce. In specialized manpower alone, Siemens will need 300-400 extra people annually in the coming years. Thus this decision by Siemens had a great many consequences. After all, the German electronics concern also wanted to produce the 1-megabit DRAM.

Speeding up the one project meant that the other suffered. In July therefore Siemens signed a contract with the Japanese firm Toshiba, which already has a 1-megabit DRAM prototype. Based on Toshiba technology--for which Siemens paid heavily--it will be possible to produce 1-megabit DRAM's next year, probably as early as September, in the factory now under construction in Regensburg. A year earlier than planned, but according to Siemens' Franz, it was necessary if Siemens was to enter the competitive battle. Philips, Franz says, has also been asked to take steps to speed up its side of the megabit project somewhat.

Franz believes in the success of the megabit project, especially because it will provide both Philips and Siemens with knowledge about submicron technology that will be particularly useful in developing chips for all sorts of products in the areas of telecommunications and automotive electronics.

It is necessary to speed up the Philips-Siemens megabit project, because the Japanese firms too are spending heavily to speed their efforts up. The reason for this is the current recession in chip sales. The present generation of chips--particularly the 64 kilobit DRAM memory chip--is being dumped on the market because of production overcapacity, often at a fraction of the manufacturing cost. Bringing the next generation into production quickly can end this recession. After all, that will create new markets for applications. And the first one to do that makes the biggest profits.

According to Siemens market analyst Gernot Oswald, the present recession in the chip industry has still not gotten as bad as in the past. In the past 20 years there have always been ups and downs, matching the introduction of new generations of chips and chip technology. But according to Oswald the pit that the chip industry has created for itself is now very deep indeed.

A year ago exaggerated expectations for the sales for microcomputers and small business computers in particular led to an enormous demand for chips. Manufacturers expanded their production lines and laid

up large inventories. There was no end of euphoria. At the end of last year however the market suddenly became sated. The chip manufacturers suddenly had enormous inventories and far too large production lines.

World sales of integrated circuits have fallen this year by 20 percent, Oswald says, from $20.6 billion in 1984 to $16.6 billion in 1985. U.S. firms in particular are suffering from the recession, European firms relatively less so. Oswald expects the market to improve again in the next few years, partly because of the introduction of the 1-megabit DRAM and other kinds of chips made with the same technology.

Expectations of growth like in the past, increases of more than 20 percent in sales--because the price falls relatively, this means tenfold increases in units sold--are possible, he says. From the end of the 1980's the megabit project is intended to guarantee that Siemens and Philips will be among the first five when it comes to bringing another new generation of chips on to the world market. It is only then, Oswald says, that you can make good profits and win back your investments. If you enter the market when the new generation of chips is already being sold at dumping prices, as has happened to Siemens so far, you will only share in the losses.

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MICROELECTRONICS

GRENOBLE SYNCHROTRON IN 1987

Duesseldorf VDI NACHRICHTEN in German 28 Jun 85 p 4

[Text] According to opinion in the FRG and in France construction can begin sometime in the spring of 1987 on the new European laboratory for synchrotron radiation in Grenoble. The cost of the ring employed in particle acceleration will be about 1.5 billion francs (495 million German marks). It is expected that up to 68 percent of this will be met by France and the FRG. In all likelihood both Italy and Great Britain will also participate in this mammoth project. In the coming months the north European countries, the Benelux states, Switzerland, Austria and Spain are expected to announce their decisions with respect to participation.

This facility for further research into the building blocks of matter is expected to be put into operation after 4 to 5 years of construction. The Europeans hope that in basic research this will put them a step ahead of the United States. There, too, there are plans for the construction of a similar installation.

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MICROELECTRONICS

GALLIUM ARSENIDE RESEARCH AT PHILIPS, LEP

Gern TECHNISCHE RUNDSCHAU in German 30 Apr 85 pp 57-58

[Excerpts] Technology

Philips Research is developing activities in the area of the entire III-V-semiconductor technology, for instance methods for the growing of gallium arsenide and indium phosphide single crystals, various methods for application of thin layers, such as the gas phase-, liquid phase-, and molecular beam expitaxy, ion implantation techniques, and aids for the design and characterization of circuits. A research team of the French Laboratoires d'Electronique et de Physique Appliquée (DEP) is trying to understand the basic phenomena, such as the low levels determining the semi-insulating characteristics, the electrical properties of the insulator/GaAs interfaces, parasitic effects in field effect transistors, etc. It was recently demonstrated in the LEP that the growing of defect-free gallium arsenide single crystals with a diameter of 50 mm and the desired electrical properties for the cited applications (n-type, p-type or semi-insulating) is possible by means of isoelectric doping. While it is known that crystal defects have a damaging effect on optoelectronic circuits, only little is known about their effects on majority carrier circuits (transistors and integrated circuits). The absence of crystal defects probably increases the homogeneity of transistors produced on the same chip, thereby increasing the performance behavior of the integrated circuits using these transistors. The Philips Research Laboratories in Redhill, Great Britain, are leaders in the development of the molecular beam epitaxy (MBE) employed there for the manufacture of structures for microwave and optical applications.

Superstructures

One result of the LEP studies of the growth mechanisms in the vapor phase epitaxy is the manufacture of GaAs (Ga/Al)As superlattices (structures with very abrupt transitions from organometallic starting material. The width of the "quantum mechanical potential wells" ("quantum wells") can be reduced to 2.5 mm, whereby at the same time a boundary layer of less than 0.5 mm is retained. Such a structure is indispensible for the manufacture of high-electron mobility field effect transistors (HEMT) and quantum well lasers.

Optimization

The investigation of GaAs field effect transistors (FET) has led to a family of low-noise FET (noise less than 1.2 dB at 12 GHz, manufactured with conventional lithographic methods) and power FET (4.5 W at 12 GHz). There is a trend towards higher frequencies (greater than 20 GHz). Such FET are installed in units for hyperfrequencies (ultrastable oscillators, mixers, amplifiers) with a wide range of application.

Integrated circuits

The research on integrated GaAs circuits in the LEP has developed in two directions: Towards integrated digital circuits on the one hand and towards monolithically analog microwave circuits on the other hand. Direct FET-coupled logic (DFCL), in which the transistors with normal pinch-off and a gate length of 0.9 um are used (Normally-Off Technology), have been selected for integrated digital circuits. This is a very simple technology for low output which could very well open the way for the production of very fast GaAs-LSI circuits. Various circuits have already been demonstrated, for example dynamic frequency dividers (by 2) which operate at a power input of less than 0.25 mW up to 1.9 GHz, programmable frequency dividers (by 5 and 6) up to 1.5 GHz with a power input of 2 mW, arithmetic-logical units (ALU) for 4-bit words with an execution time of 3,5 ns at a power input of 15 mW. Finally, static read-write memories (SRAM) have been realized with an access time in the magnitude of one nanosecond.

Satellite Television

The research conducted on monolithic integrated analog circuits on a GaAs basis proceeds in the laboratories mentioned principally with circuits for the reception of satellite radio signals in the 12-GHz range. A first step in this respect was the design of individual IC for each of the radio stations required, for instance a 12 GHz amplifier, an image reception suppressor, a 10.8 GHz osciallator stage, a mixer and an intermediate frequency amplifier (0.95 to 1.75 GHz) with interdigital capacitors, MIM (metal-insulator-metal) capacitors and helical coils. The objective of integrating all functions of a 12 GHz television receiver on a single GaSa chip has been attained. The chip is 2.5 x 2.5 mm in size, the mix amplification is 25 ± 3 dB (12 GHz input - UHF output) with an overall noise number of 4.5 dB.

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MICROELECTRONICS

BRIEFS

IC DESIGN PROJECT--Government efforts to strengthen the position of the FRG vis-a-vis the United States and Japan, its competitors in world markets, by promoting research and development in the microelectronics area, now also have the large-scale support of industry: with about DM20 million, Siemens AG is promoting the Design of Integrated Circuit (EIS) project launched in mid-1983. Besides receiving funds for staff positions, the universities are getting the computer design system Venus free of charge, including the necessary hardware. This is the first time that German private industry assumes the role of promoter of research and development in the microelectronics area to such a large extent. The Society for Mathematics and Data Processing (GMD) and Siemens have reached an agreement on how to work with the particpating universities. This effort extends from the introduction of the design system, through supporting chip design, to providing assistance in chip manufacturing. The agreement a- the joint responsibility of large-scale government research and of industry to ensure that national teams of experts master the methods and tools for designing and testing of large scale and very large scale integrated circuits. This is to make an important contribution to ensuring our future as technological leader in response to the U.S.-Japanese challenge. A total of 30 university departments at 14 universities, all coordinated by the GMD, are currently collaborating on this EIS project, whose sole supporter so far has been the Federal Ministry for Research and Technology. The involvement of Seimens will permit the participation of up to 12 more university departments. In view of this project's importance for strengthening our research potential and for disseminating the necessary knowledge in the FRG, the GMD research in the very large integrated circuit area is being turned into a large project. The project will be called EIS (Design of Integrated Circuits) and it will be the direct responsibility of GMD management. The project is directed by a collegium, with Siemens and GMD sending one representative each. Additional partners from industry are welcome to join; it is entirely possible that the project will be expanded into an institute at a later date. A project council, in which the Federal Ministry for Research and Technology, GMD, Siemens and two scientists have one seat each, are advising the GMD board of directors on managing the project. /Text/ /Leinfelden-Echterdingen DIE COMPUTER ZEITUNG in German 29 May 85 p 4/ 7994/12228

AUSTRIAN CAD/CAM INSTITUTE--As part of the 920 million schilling, 3-year support program of microelectronics, minister for Transport and Public Economy, Ferdinand Lacina, announced the foundation of a CAD/CAM institute in a press conference. The purpose of this institute is to provide manufacturer-independent

advice to CAD users. The company set up to operate the institute will be wholly-owned by the federal government. Lacina's ministry represents the owner. Starting in September, the institute will support business through seminars, courses, exercises and demonstrations in addition to providing advisory services. The operating company will collaborate closely with the Seibersdorf Research Center and the Institute for Flexible Automation at Vienna's Technical University. A former assistant at the Technical University, who is currently working for General Electric, has been proposed to head the CAD/CAM Institute, which at this point will have 4, and eventually not more than a maximum of 12, employees. Lacina was not yet ready to reveal his name. "In a few years, it will be impossible to compete without the use of CAD. But searching for the right system requires much time and large financial outlays. It is this very procedure which the new institute is designed to shorten," Lacina said. Subsidies of up to 50 percent (a maximum of 200,000 schillings) will be offered during the planning phase of CAD/CAM systems. Expenditures for hardware and software procurement will then be subsidized up to 30 percent, to a maximum of 1 million schillings, per enterprise. /Text/ /Munich COMPUTERWOCHE in German 19 Apr 85 p 125/ 7994/12228

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SCIENTIFIC AND INDUSTRIAL POLICY

SWEDISH FIRMS ASEA, VOLVO, ERICSSON INTERESTED IN EUREKA

Stockholm NY TEKNIK in Swedish 25 Jul 85 p 2

[Article by Hans Henrik Ronnow]

[Text] Per Gyllenhammar wants to join the European technological cooperation Eureka:

"Biotechnology, new materials, aircraft and space technology should be conceivable areas for Volvo."

Last week, Western Europe decided how to organize Eureka, its new high technology research cooperation. Representatives of 17 nations found it best to encourage enterprises to organize their cooperation. Several Swedish enterprises are interested.

Prime Minister Mitterrand of France has for the past 3 months been endeavoring to unite Western Europe in a large-scale--though vague--research project. Unless the Europeans unite, American technology will take hold of the European market through Reagan's concentration on a research project, SDI, the Star Wars Program.

Last week, foreign and research ministers of 17 European countries, including Sweden, attempted in Paris to decide on the set-up of Eureka.

One-Day Meeting

At the meeting, which lasted one day, it was decided not to decide upon any special set-up. Nor was any position taken on the questions how much Eureka was to cost and who were to pay.

The meeting agreed that Eureka will not be a permanent organization with an overall research objective but rather a number of research initiatives and invitations for cooperation.

The ministers felt that the whole thing could function by, for example, two or more enterprises in some countries proposing technical cooperation to one

another. Each state which is a member of Eureka may, subsequently, evaluate on a case-to-case basis which project will be supported with funds or in some other way. No country need participate in all projects, not even in most of them.

Sweden Positive

The Swedish representatives at the Paris meeting, Vice Prime Minister Ingvar Carlsson and Under Secretary Carl Johan Åberg, found that such a cooperation suited Sweden extremely well. Prior to the meeting of ministers, the Swedish government had given a number of Swedish enterprises what little information was available on Eureka.

Through the Federation of Swedish Industries, they had also made inquiries as to which enterprises wanted to participate in a cooperation.

Before the vacation of Swedish industrial enterprises at least five enterprises had responded. ASEA, Atlas Copco, L M Ericsson, Saab Scania and Volvo all gave expression to a generally positive interest. Saab Scania felt that they would be able to contribute expertise in areas such as supercomputers.

Volvo's Pehr Gyllenhammar says that Eureka was merely a rough idea but, at any rate, ventured to give a few examples of areas of activities suitable for Volvo:

"New materials, biotechnology, aircraft and space technology."

Not Military

From official Swedish quarters it was pointed out at the Paris meeting that the cooperation should not be military.

In modern research, it may, however, be difficult distinguishing between civilian and military technology. But Carl Johan Åberg found that it should not cause any difficulties in evaluating research projects:

"They must not have military objectives, nor be financed by military authorities."

Nor did a representative of a French military technology enterprise find this problem too difficult. Pierre Agrin of Thomson pointed out that military and civilian labels for research were a question of "ways in which to present research projects."

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SCIENTIFIC AND INDUSTRIAL POLICY

SWEDEN PLANS EUREKA PROJECTS, COMMENTS ON HANNOVER MEETING

Government Wants to Participate

Stockholm DAGENS NYHETER in Swedish 6 Nov 85 p 11

[Article by Mats Holmberg]

[Excerpts] Sober-Minded Atmosphere

Last Tuesday, eighteen ministers gathered in Hannover's giant industrial exhibition center in a markedly sober-minded atmosphere. The trumpet blasts from Paris had become somewhat subdued. As the outlines of the future Eureka had become more distinct, if at all, they gathered around a clearly leaner project than originally perceived.

"For the present, the government of Sweden does not plan to appropriate any special funds for Eureka projects," Minister Ingvar Carlsson told his colleagues, and, on this particular point, a certain measure of European unanimity prevailed.

No joint post will be set up for Eureka. Each country will decide for itself how to finance joint projects, which, in the case of most countries, involve no new state funds at all.

Secretariat Shrunk

The enormous Eureka secretariat which formed part of the original French plans will become considerably reduced--if at all set up.

"Eureka will not be allowed to create any new international bureacracy," said Ingvar Carlsson in his speech last Tuesday, and similar viewpoints were advanced by several other European countries.

According to the communique that was issued last Wednesday, the governments of Europe will function as some kind of intermediaries for the enterprises of

their countries. They will keep abreast of the research that is carried on in other countries and will provide the various enterprises with information. They will pave the way for cooperation, for example, on the basis of joint standards.

"Would the enterprises or already existing bodies not have been able to manage this without Eureka?"

Risk Involved in Being Left Outside

"The question is justified," says Under Secretary Kerstin Niblaeus in the Cabinet Office. "But we have asked the industrial enterprises whether they want for the government of Sweden to become involved. I believe that we would have become subjected to much criticism from the industrial sector if we had chosen not to become involved."

"For Sweden as a non-EC country, Eureka is interesting," says Kerstin Niblaeus, "in that it provides the opportunity for talks and exchanges of information where we would otherwise normally be left outside."

"Eureka already exists as an idea," she says. "We are not the ones who have developed that idea. But it would be difficult to choose to jump off a train which is already on its way."

Two Projects Suggested

Stockholm DAGENS NYHETER in Swedish 7 Nov 85 p 8

[Article by Mats Holmberg]

> [Excerpts] How does one reduce and render harmless environmental poisons in the atmosphere over Europe? How are European researchers to talk to one another in a joint computer language via already existing telecommunications networks?
>
> In connection with these two questions, Sweden will participate in research within the framework of the European technological project EUREKA.

Opening Up Doors

What does EUREKA have to offer a country such as Sweden?

"The very fact that EUREKA exists as a concept may open up doors for Swedish enterprises," Ulf Dinkelspiel of the Swedish delegation stated. "We may, for example, within the EC carry on talks on a more equal footing than was previously possible."

In about thirty instances, Swedish enterprises already conduct far advanced talks on joint research with partners in Europe. With reference to the obligation to preserve industrial secrecy, the Swedish delegation declined to reveal their names at Hannover, and other Nordic delegations complained of Sweden's secretiveness and "noticeably low profile."

"I prefer calling it pragmatism," Ulf Dinkelspiel said. "We have not found it worth while to distribute lists of projects that we should like to have. We want to give the enterprises free hands--if some of them would need the support of the government, we shall be prepared to offer it to them."

Pragmatism

Sweden will, for example, arrange regular meetings of researchers where enterprises may look into possibilities of cooperation without any obligations on their part.

Is Eureka really the key to "the rebirth of European technology," as claimed by its most fervent advocates in the past?

Not even when the eighteen ministers parted last Wednesday had that question been fully answered. France, which 7 months ago developed the idea, talked about Eureka in optimistic and poetic terms, Sweden and Great Britain with restrained skepticism.

Relieved

Still, a certain amount of relief was discernible that the feelings which, at some point in the past, had generated the concept of Eureka are so widely embraced.

Europe, the eighteen ministers agreed, would have to cooperate in order not to lag behind American and Japanese technological advances.

Whether this cooperation will improve or change because it is called Eureka seemed less important.

Editorial Views Meeting

Stockholm DAGENS NYHETER in Swedish 10 Nov 85 p 2

[Editorial: "EUREKA--One Step Further"]

[Text] Sweden is still interested in the idea of Eureka. Concretely, we participate in two out of ten projects of cooperation that have been agreed upon within the framework of Eureka. As far as Sweden is concerned, this is the result of Eureka's second conference of ministers, held at Hannover during the past week.

In a state of wait and see but positive--this is, in short, the position in general of the eighteen countries participating in Eureka, although there are

differences of degree. That is actually a wise position. The endeavors on the part of Western Europe not to lag entirely behind, first and foremost, the United States and Japan in the technological race need joint involvement of this kind.

The Hannover meeting developed the Eureka project a couple of steps further compared to the initial conference in July in Paris: the forms of cooperation were laid down in somewhat greater detail, the question of a single secretariat will be solved prior to the next meeting of ministers (in London in May) and ten cooperation projects have been given the Eureka stamp. Last but not least, several countries, including West Germany and Great Britain, have followed the example of France and taken a positive position on public research grants for Eureka projects.

This, however, has not ensured the future of the Eureka project. Whatever Mitterrand may have had in mind when he launched the idea of Eureka, Eureka is no organization of the type of Euratom, the future of which may be evaluated at a certain point of time. Eureka is a way for West European industries and research institutes to get to know one another and to cooperate. Several projects which will be given the stamp of Eureka would have come about without Eureka, but many which may now be arranged might never have materialized for the simple reason that enterprises and research centers would not have got into contact with one another.

To Sweden, the role of Eureka as a coordinating body and information center is important. When it comes to projects in which we want to become involved, Sweden will have to choose a la carte like the rest. This freedom of choice is, naturally, of particular importance for a country that is free of alliances. For even if Eureka will be operating exclusively in the civilian area, it is, for example, in many cases practically impossible to distinguish between civilian and military usefulness of certain forms of basic research.

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SCIENTIFIC AND INDUSTRIAL POLICY

PORTUGUESE MEET TO DETERMINE EUREKA PARTICIPANTS

Lisbon DIARIO DE NOTICIAS in Portuguese 13 Oct 85 p 5

/Text/ Representatives of 11 companies, 2 scientific institutes and 1 credit institution held a meeting to determine Portuguese entities interested in participating in the Eureka project.

The meeting, which was led by the five members of the Portuguese work group, was held for the purpose of the filling out of forms by companies interested in finding European partners who might want to participate in projects of technological development in the area of the new technologies.

The work group, composed of Industry and Energy Minister Carvalho Rodrigues, Foreign Affairs Minister Martins da Cruz, Mario de Abreu of the National Council of Scientific and Technological Investigation, Herlander Estrele of the National Development Bank and Omar Karim of the Portuguese Industrial Association, is now scheduled to delve thoroughly into the projects or intended projects presented by the Portuguese companies.

A dossier with the participation proposals will be compiled and presented on 16 and 17 October at a meeting of 18 national representatives preparatory to the final Eureka proposal to be approved at the Hanover Ministerial Conference on 5 and 6 November.

According to the members of the work group, the Portuguese dossier will in no way be inferior to that of many countries which have already presented their portfolio of projects, which means that the Portuguese companies have the capability of coming up with acceptable technological innovation.

Five companies and research institutes have already reached agreements with European partners for the development of projects, particularly in the areas of telecommunications, new biotechnologies and the exploration of maritime and oceanic resources.

Ways to finance the projects will be analyzed in great detail at a meeting to be held tomorrow in London at which the work groups of the 18 countries which have subscribed to Eureka will be present.

According to Herlander Estrela, "financing is no problem, for money can always be arranged if the projects are viable."

Eureka's objective is to stimulate research in new technologies pertaining to products and market processes in order to give Europe a competitive spot in the world picture and in relation to the United States and Japan.

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SCIENTIFIC AND INDUSTRIAL POLICY

FIRST CONCRETE RESULTS OF ESPRIT REPORTED

Paris ELECTRONIQUE ACTUALITES in French 4 Oct 85 p3

[Article by F. Grosvalet: "Halfway Through Phase I: The First Positive Results of ESPRIT"]

> [Text] We wrote last week that 18 months after it started, ESPRIT [European Strategic Program for R&D in Information Technologies] had already proved a success. We must qualify this statement with the fact that ESPRIT is certainly a success--as demonstrated by the fact that over 600 people participated in the second technical symposium, last week in Brussels--but only as far as the objectives set in the program are concerned, which, we must admit, are rather limited.

Further measures must be taken in the domains of markets, infrastructures and cultural and intellectual environment in order to go beyond pre-competitive research and make the European information-technologies industry truly competitive worldwide. In addition, the problem of the continuation and extension of ESPRIT still remains to be solved.

Apart from this, several undeniable facts support the statement that ESPRIT is now a success.

173 Projects in Progress

Positive results have already been obtained directly, in terms of products and technology as well as in terms of agreement on standards.

We can thus mention: the announcement that Delphi will market an expert system called Omega that was developed under Project 440 (Advanced message-passing architectures and description Systems); development, under Project 97 (Advanced algorithms, architectures and layout techniques for VLSI signal processing), of a CAD tool that, together with other existing tools, has already made it possible to develop a complex digital filter within one week; development of a GaAs 256-bit 1.5-ns static RAM (Project 232, Integrated circuits and composite semiconductor materials); or the implementation of an ADA-based portable-tool prototype.

Program officials in Brussels also mentioned:

- the number and quality of the proposals, which represent a financing five times greater than available resources. Note that, in the 95 projects adopted in 1985, 2 companies out of 3 are newcomers;

- the actual cooperation taking place among companies at transnational level, with an average of five participants per project;

- the increasing number of interested companies and countries from outside the Community;

- the new industrial alliances emerging from the ESPRIT experience, such as the Philips-Siemens Mega-Project, the fact that 12 European manufacturers have agreed on data-processing standards, that 6 others have agreed to use the UNIX System V as an operating system, and the joint R&D center of Siemens, Bull and ICL [International Computers Ltd.];

- the fact that 18 months after the program started 173 projects are now in progress.

Reasons for this Success

According to program officials, the success of ESPRIT is due to the favorable conjunction of various factors having to do mostly with the qualitative and quantitative importance of the information-technologies sector (the largest worldwide) which, from the start, gave a Community and continental dimension to the program.

Still according to Brussels officials, the program meets needs intensely felt by the industry. Indeed, just at the pre-competitive stage, the investments required in this field exceed by far the financing capabilities of any single enterprise. As a result, cooperation is required at this stage, and this is not a typically European problem, as is shown by examples in the United States (MCC, SCR, MCNC) and Japan (fifth-generation computer project and others).

In addition, the credits committed are considerable: they represent 25 percent of the pre-competitive research expenditures of European information-technologies companies (8 percent of the amounts devoted to this field worldwide).

Considerable, however, does not mean adequate (all those who attended the technical symposium acknowledged this) and if we replace ESPRIT in its international context, we can see its merits as clearly as its limitations, and two questions remain unanswered: can ESPRIT improve the competitiveness of the European industry? Is it adequate? And, if not, what are the accompanying measures that should be taken?

To make the European industry competitive, according to Brussels officials, ESPRIT must continue to provide impetus for the creation and development of cooperation relations among EEC companies. It must therefore be continued and expanded at industrial development level. This could be done during

the second phase of ESPRIT (1987-1991), the research program for which should be presented next summer.

Alone, it is inadequate and must be accompanied by assertive measures in three domains: market, infrastructures and cultural and intellectual environment.

In particular, the European market, which accounts for 25 percent of the world market of information technologies, must become a reality, for instance through the introduction of common European standards in the fields of telecommunications and information technologies.

In the other fields, we should mention and point out that the Brussels commission just set up:

- RACE [R&D in Advanced Communication Technologies for Europe] whose objective it is to create telecommunication infrastructures, products and services;

- BRITE [Basic Research on Industrial Technologies for Europe], a program focussing on the development and implementation of new technologies in the so-called traditional industrial sectors, and which operates like ESPRIT;

- COMETT [expansion unknown] to promote education and training in this field.

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SCIENTIFIC AND INDUSTRIAL POLICY

REVIEW OF SOME CURRENT ESPRIT PROJECTS, PARTICIPANTS

Paris ELECTRONIQUE ACTUALITES in French 4 Oct 85 p 16

[Article by F. Grosvalet: "Participating in 18 Projects out of 24 in 1985, France Is Strongly Represented in the ESPRIT Microelectronics Project"]

> [Text] As after the first invitation for bids (see ELECTRONIQUE ACTUALITES dated 1 February 1985), French manufacturers and public and private research laboratories are strongly represented in the 24 advanced microelectronics projects adopted by the officials of the European ESPRIT program [European Strategic Program for R&D in Information Technology] for 1985.
>
> They participate in 18 projects and are even managing 10 (3 with CNET [National Center for Telecommunications Studies] as prime contractor, 2 with CII-HB [International Data-Processing Company-Honeywell-Bull], 2 with the LEP [Electronics and Applied Physics Laboratories], 1 with Rhone-Poulenc Systems, 1 with MATRA [Mechanics Aviation and Traction Company] and 1 with Thomson-CSF).

Some of the 24 projects adopted this year take up, and improve on, proposals previously made, whereas others are part of current programs, and we can therefore say that about 40 teams with an average of 5 members are now working in the field of advanced microelectronics for information technologies.

We are going to review all these 24 projects, ranging from silicon or III-V compound technology to circuit layout, materials used for integrated-circuit manufacturing, CAD tools or production equipment.

In silicon technology, as announced in February by ESPRIT officials, the projects adopted this year are only type-B projects (short term, more general projects) designed to support the larger projects adopted last year which, as is known, involve MOS and bipolar submicron technologies.

Thus, Rhone-Poulenc Systems will head a project for "the development of high-performance polymer insulators for multilayer interconnection systems"; its partners will be AEG Telefunken, Thomson CSF and the Toulouse University.

Research on submicron contact technology and the corresponding reliability problems (SGS [expansion unknown], AERE Warwell, MATRA, Telettra, Aarhus University in Denmark, QUB [expansion unknown] and the Italian CNR [National Research Center]) will also support the development of submicron silicon technologies, like the "Optical interconnection for VLSI [very-large-scale integration] and fast-integrated circuits" project (General Electric, Telettra, Southampton University) that was adopted in 1984 but whose objectives were redefined, or like the project on "ultra-sensitive analysis of impurities in structures and materials" (IMEC [expansion unknown], Atomica Technical Physics, Philips and Siemens).

Other projects concern manufacturing and encapsulating problems. Thus, the CNR (Italy), the CNRS [French National Center for Scientific Research], Kings College, SGS and Thomson CSF are studying, among other things, masks and lattices for X-ray submicron (0.5 micron) lithography, and another group (Ferranti, BMP [expansion unknown] of the FRG, British Telecom, IMEC, Siemens and Valvo) is studying more generally an advanced technology to produce masks and lattices for submicron VLSI integrated circuits.

In the field of encapsulation, two groups are dealing respectively with "the encapsulation of high-performance VLSI for complex systems" (CII-HB, British Telecom, Marconi Research Center) and "the encapsulation of high-speed GaAs digital integrated circuits" (MO Valve, Thomson CSF, Madrid University).

Research on Full-Wafer Integration

A number of projects adopted this year also cover subjects that are more general and more directly related to the development of new circuit types for the information technologies.

The MATRA-IMEC-SGS project on refractor-metal grid transistors falls in this category, like the research project on a very-high-performance bipolar structure (Berlin University, Thomson CSF).

Thomson CSF, the CENG [Grenoble Nuclear Research Center], ICL [International Computers Ltd.], NRMC [expansion unknown], the INPG [Grenoble National Polytechnic Institute] and the Languedoc University have submitted a project on full-wafer integration to complement and continue the CAD project for a VLSI "high-yield high-reliability ultra-large-scale-integration system" adopted in 1984 and whose objective it is to define system architectures adapted to full-wafer integration. Research done by the first group (see ELECTRONIQUE ACTUALITES dated 1 February 1985) have already made it possible to identify two types of architectures: one with multiple pipelines and one with a network of identical processors. We shall come back on these in one of our next issues.

Another general project adopted this year covers "complex large-area liquid-crystal displays controlled by thin-film transistors."

In the second stage of Phase I, ESPRIT officials favored composite semiconductors and adopted six projects in this field, including one on "GaAs-GaAlAs

bipolar integrated-circuit technology" (CNET, Farran Technology, GEC [British General Electric Company], NRMC [expansion unknown], Plessey, PTL [expansion unknown] which takes up parts of the two projects adopted in 1984.

The five remaining projects cover respectively: composite semiconductor integrated circuits (STC, Farran Technology, GEC, Philips, Plessey, Siemens, Thomson CSF); basic technological research on GaInAs MISFETs [metal-insulator semiconductor field-effect transistors] (LEP, Aixtron, RWTH Aachen [expansion unknown], Wacker); InP integrated optoelectronics (two projects: one at the CNET, the other led by CSELT [Center for Telecommunications Research] with AEG [German General Electricity Company], Telefunken, CGE [French General Electricity Company], GEC, STC [Storage Technology Corporation] and Thomson CSF); and, last, production of large-diameter semi-insulator GaAs wafers (LEP and Wacker).

Computer-aided design has of course not been forgotten, and there are six projects in this sector: CAD for VLSI systems (CNET, AGE Telefunken, CIT Alcatel, CSELT, GMD [expansion unknown], Italtel, MATRA, SGS); ECIP (European integrated computer-aided design project) with CII-HB, CIT-Alcatel, ICL, Philips, SGS and Siemens; AIDA (advanced integrated-circuit design aid) led by Siemens, with ICL, Thomson, IMAG [Grenoble Data-Processing and Applied Mathematics], etc.; cooperative development of an integrated, hierarchical and multiview VLSI design system with distributed work-station management (Delft University, British Telecom and others); modular design (IMEC, Philips Silvar Lisco); and the definition of algorithms for a strong and efficient semiconductor simulator (GEC, Analog Devices, Philips, SGS, MIETEC [expansion unknown] and others).

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SCIENTIFIC AND INDUSTRIAL POLICY

MAIN AREAS OF HIGH TECH R&D SPENDING FOR AUSTRIA 1984-85

Duesseldorf HANDELSBLATT in German 28 Aug 85 p 7

[Article by E. Barth von Wehrenalp: "Separating Responsibility Between Scientists and Politicians; Research Promotion in Austria; A Clear Increase in Expenditures"]

[Text] Austria has at its disposal only a narrow foundation for autonomous research and development policy in a field ruled worldwide by the military-industrial complex, Austrian Minister for Transport and Nationalized Industries Ferdinand Lacina emphasized at a meeting of the Alpbach European Forum. He said that as a small country, Austria must strive to maintain its level of information regarding technological developments and innovation and that it must at least keep its foot in the door for research and development policy by the giants. According to Lacina, the State in Austria must play an important part in research and development policy in the future as well and it must encourage cooperation with the universities and industry. The 1985 research report currently made public by the Austrian federal Ministry for Science and Research indicates that from 1984 to 1985 an increase in expenditures from about 16.1 to 17.4 billion Austrian schillings was able to be budgeted.

The report establishes the following basic principles in regard to the current situation and the needs of Austrian research:

1) A clear separation of responsibility between scientists and politicians. Political decisions cannot be made by scientists, however; the scientists can only provide the information required for making alternative decisions. Nevertheless, what is needed is a permanent dialogue between politicians and scientists as well as adequate structures created by means of appropriate advisory organs, such as represented in Austria by the Austrian Council for Science and Research and the Austrian Conference for Science and Research, as examples....

2) The civilized world has reached the limits of environmental stress and finds itself facing an economic situation where traditional theories of national political economy will have to be reconsidered.

3) Environmentally compatible technologies are required, while at the same time the employment situation and humanization of the working world must be taken into consideration.

4) A balance between economies and ecology must likewise be pursued, just as emotionality must be prevented from substituting for objective discussion.

5) An effective research policy also requires a corresponding "research consciousness" on the part of the public for understanding the needs of science and research. In this connection, advance measures should be taken so that the use of public funds for research and development (R&D) is fully transparent.

6) Finally, in view of the multitude of problems requiring solution, the establishment of areas of concentration is needed in conjunction with the promotion of research in general. In addition to this it must be stated that the results of science and research that bring direct or indirect economic benefits must also be complemented by the capability to conduct scientific research under stable conditions in the so-called "ivory tower subjects" as well.

Health Field Accorded Priority

The graph shows how research in Austria is financed. The federal government provides about 41.3 percent, the provinces 5.7 percent, and other sources of public financing (local communities, councils, and social insurance carriers) 1 percent, making a total of 48 percent on the part of the public sector. The business sector provides 49.3 percent and other sources provide 2.7 percent.

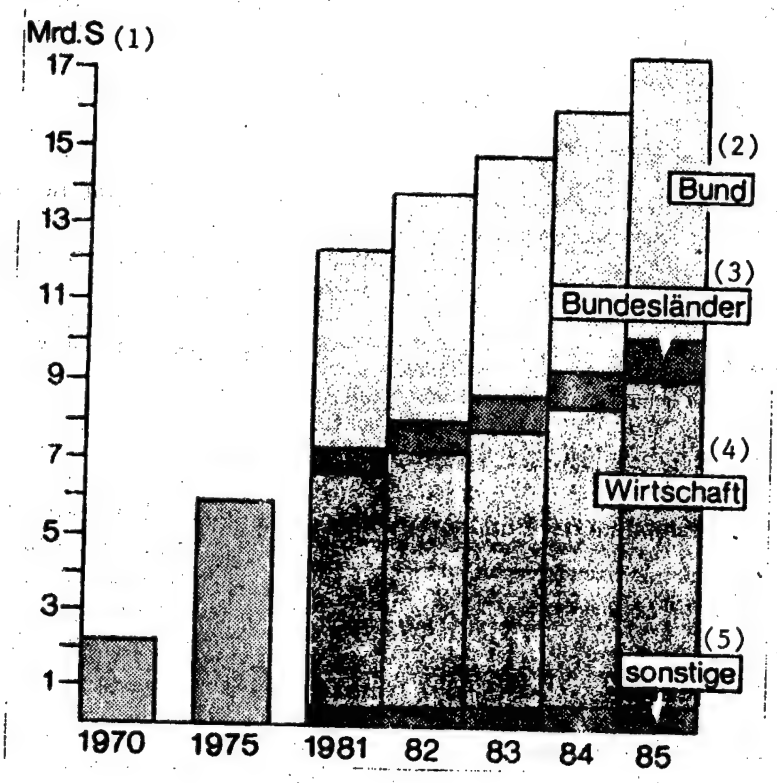
It appears to be significant that, broken down according to socio-economic objectives, 30.2 percent of total federal expenditures for research is for the benefit of the health field, 28.2 percent for the benefit of the general expansion of knowledge, 15.8 percent for promoting trade, commerce, and industry, 7 percent for the benefit of social and socio-economic development, 5.3 percent for promoting agriculture and forestry, and 4.2 percent for promoting the production, storage, and distribution of energy.

In terms of research by field of specialty, microelectronics represents an area of particular technological concentration for the years 1985 to 1987. Here microelectronic applications and the research results which they produce are to be given special encouragement, particularly by means of establishing new companies, diversification, structural and product improvements, and transfer of assembly functions.

Biotechnology and Genetic Engineering

In the field of semiconductors, the project for "development of a high-performance laser for technological application" is being pushed forward. A new large-scale integration technology for digital circuits is slated for development in the field of microprocessor engineering. It is hoped that the basic result of such technology will be the achievement of shorter switching times and lower power losses.

Financing of Research and Experimental Development
Conducted in Austria, 1970-1985



Key:

1. Billions of Schillings
2. Federal Government
3. Provinces
4. Business Sector
5. Others

Source: Research Report of the Austrian Federal Ministry for Science and Research

In the field of communications technology, the successful linkage of computers and local computer centers using systems made by different manufacturers is being researched, and, in addition to other assignments, a multi-purpose universal programable intelligent decoder (MUPID) is also being developed and handed over to an Austrian firm for production. A research contract awarded in 1983 for the "development of a compact system for digitalizing complex graphical patterns" is being continued within the realm of "digital image processing and graphics."

The Austrian Study Association for Cybernetics was awarded a research contract in the field of "artificial intelligence" regarding the topic "A Medical

Consultation System for Diagnosis and Treatment on Portable Microcomputers." The problems of robotics and of automation technology are likewise being studied. The table below lists the key institutions, their directors, and the areas of concentration in their field of activity.

Biotechnology and genetic engineering represent an additional area of concentration in research. A particularly positive aspect of biotechnology is seen in the fact that "in most cases products from agriculture and forestry, but also waste products from the food and beverage industry, can be used as initial substrata." In the case of biotechnology as well as genetic engineering, initially "the emphasis will lie in improving the infrastructure of the existing institutions by means of additions to personnel and equipment and by means of improvement in the level of training, for the purpose of establishing more efficient centers for basic research."

"Material sciences and materials testing" are likewise an area of research concentration. The following are being promoted in this context: production of semiconductors and related products, construction materials for astronautics, high-temperature materials with a heat resistance of between 950 and 1100 degrees under prolonged stress, new forming procedures for the processing of superalloys that cannot be shaped on the basis of conventional methods, as well as the development of biologically compatible synthetic substances, of composite materials, of new construction materials, etc. The report mentions that the aim of this area of research concentration is not only to intensify Austrian research in this area, but also to "promote cooperation between university and non-university research with research in the field of industry, and to harmonize, i.e., to integrate, research and development projects conducted at the national level with projects conducted within the framework of international cooperation, wherever this may be possible."

Substantial amounts are being spent in the field of energy research for energy-saving possibilities, while the study of new as well as renewable energy sources is being advanced without neglecting research on reactor safety, on coal and the rational production and distribution of electric power, on nuclear fusion, and on energy storage. Very substantial expenditures--"even in comparison to all of the member states of the International Energy Agency"--were made for research activity concerning the use of biomass as a substitute for petroleum. Even solar energy research, which first began to be more intense in the summer of 1982, has yielded the result that the utilization of solar energy might be full of possibilities for Austria in the medium and long-term.

With justified pride, the research report states in regard to the energy field: "Experimental operation of a 1 kW converter for wind power resulted in mass production by VOEST-Alpine AG, which now has available mass-produced equipment for 1 kW, 3 kW, 20 kW, and 30 to 50 kW." It then adds: "Combined wind/solar power supply for a 200 watt Postal Service transmitter in alpine areas was completed in 1984 and it represents one of the most remotely located wind and solar installations in the world." Finally, the use of electricity as propulsion for motor vehicles is also being studied because it is accorded "greater significance in the future" than at present.

Key Institutions in the Austrian Promotion Program for Microelectronics

	Area of Concentration	Key Institution
1)	Semiconductor Engineering	Association for Microelectronics (Prof. Paschke)*
2)	Sensors	Laboratory for Sensor Technology of the Joanneum Graz Research Association (Prof. Leopold)
3)	Microprocessor Engineering	Research Institute for Microprocessor Engineering at Johannes Kepler University, Linz (Prof. Muehlbacher)
4)	Communications Technology	Institute for Applied Information Processing of the Austrian Computer Society (Prof. Maurer)
5)	Process Data Processing	Research Institute for Real-Time Data Processing (Prof. Kopetz)*
6)	Digital Image Processing and Graphics	Institute for Digital Image Processing and Graphics of the Joanneum Graz Research Association (Dr. Glaenzer)
7)	Artificial Intelligence	Austrian Research Institute for Artificial Intelligence of the Austrian Study Association for Cybernetics (Prof. Trappl)
8)	Robotics	Research Institute for Robotics at Vienna Technical University (Prof. Weseslindtner)*
9)	Flexible Automation CAD/CAM	Austrian Research Center at Selbersdorf, Production Branch (Prof. Detter)
10)	Instrument Technology and Data Processing	Austrian Research Center at Selbersdorf, Specialty Branch for Instrument Technology and Data Processing (Prof. Eder)
11)	Quality and Reliability	Electrical Engineering Institute, Division for General Electrical Engineering (Graduate Engineer Oismueller)
12)	Advance Technology Assessment	Institute for Socio-Economic Developmental Research (Prof. Reichardt)

*Established in 1984

International Cooperation

The economic policy aspects of the cooperative research projects mentioned in the report must in no case be overlooked; on the contrary, they must be given particular emphasis. There is, for instance, the cooperative project on "Science and the Economy," which reveals in particular the hindrances standing in the way of better collaboration between the fields of science and industry, as well as the ways in which these hindrances can be reduced and eliminated. The demand made for the future is: "It will therefore become increasingly important in the future to analyze and to consider the social, political, and legal effects of technological innovations upon the next generation, while at the same time, however, illuminating the necessity for technological advances, providing justification for such advances and explaining their consequences, in other words, reducing the existing hostility towards technology and strengthening its acceptance in society."

The "research initiative against forest mortality" is being given absolute priority with 25 research projects in the fields of "immisions," emissions, and long-range detection, with numerous university and non-university research agencies taking part. This overview leaves unmentioned the multitude of special research activities which are also being conducted by individual institutes.

Of particular substance and importance, however, is the expansion of international cooperative research. Thus, for example, projects in the area of environmental research are also included in international research programs, such as UNESCO's program "Man and the Biosphere" (MAB). Among the museums, it is the Museum of Natural History in particular that is developing noteworthy activities with its participation in international programs, for example in UNESCO's International Geological Correlation Program and with its participation in bilateral projects in Europe and overseas.

The Austrian Archaeological Institute has achieved remarkable results with its excavations and research operations not only in Austria, but also in Greece, Turkey, and Egypt--just at the diggings in Ephesos in 1984 alone 66 academicians and students, as well as 150 laborers, were employed.

Negotiations with Sweden

A number of cooperative research projects were initiated between Austria and Hungary in the field of building construction. The first meeting of the Austrian-Soviet working group for building construction and construction materials took place in September, 1984. Eight discussions were held with Swiss experts concerning the construction of sewage treatment facilities, and discussions took place with German experts concerning the field of sauna construction. A program to exchange information with the Chinese Ministry of Geology was started. The Fund for the Promotion of Scientific Research signed a cooperation agreement with the National Science Foundation (NSF) in the United States.

In addition, Austria is involved in more than half of the total number of COST [expansion unknown] projects being carried out by the European community. Special efforts are being devoted to Austria's participation in the ESPRIT program in the information technology sector. In the field of immunology, a multilateral cooperative research program (EURAGE) is in preparation and efforts are being made to intensify collaboration with the United States. In addition, Austria is associated with the European Space Agency (ESA) until March, 1986, whereby eight agreements are already in force between the Republic of Austria and ESA regarding participation in individual scientific programs. Beginning in 1989, a satellite is planned for collecting climatological and geographical data in particular and for transmitting such data to Earth. Since 1968, Austria, together with 34 other states, has been a member of the Committee in Space Research (COSPAR), which in 1984 held its 25th convention in Graz.

Within the framework of the International Energy Agency, Austria is involved, among others, in projects that deal with industrial heat pumps and ground heat pumps having vertical heat exchangers and with new refrigeration mixtures for heat pumps.

An intensification of work with the United States was agreed upon in line with bilateral cooperation. The Austrian-Maltese Research Center for Solar Energy is being expanded further. Negotiations were initiated with Sweden in regard to the testing of Swedish-designed solar cells. The Austrian-French cultural agreement also makes possible fruitful collaboration in the field of metallurgy and the material sciences, as well as in the areas of biotechnology, genetic engineering, nuclear physics, plasma research, and medicine.

Cancer Research Concentrated in Vienna

Scientific-technical collaboration was expanded considerably with the GDR, with which 41 cooperative projects are currently underway and with an equal number still under preparation. Positive results are also apparently being produced by cooperative research projects with Hungary, Romania, and Saudi Arabia. For 8 years cooperation with Israeli research institutions has also taken place, particularly for the development of photoelectric and photochemical solar cells. A cooperative project with Switzerland was also developed successfully in the field of production techniques for superconductive wiring manufactured through the use of powder metallurgy. The Soviet Academy of Sciences has invited Austria to participate in the "Venera Halley" project, and the research centers in Graz are participating with NASA in the preparatory work for exploration of the planet Venus, planned for 1987.

Finally, if one bears in mind that Austria, which after all is a small, neutral country, has gone from spending about 12.3 billion schillings in 1981 to about 17.4 billion in 1985 on financing research and experimental development, the greater part of which is accounted for by private business and the federal government, then one can understand the recently publicized announcement that Vienna was selected as the location for an international genetic engineering laboratory. Here 40 to 60 highly qualified scientists from throughout the world are scheduled to conduct cancer research. Vienna was chosen as the

location, even though a number of European states (Federal Republic of Germany, France, and Great Britain) were competing for the project, because Vienna enjoys the reputation of being one of the international centers for biotechnology.

Klaus Meyer-Abich, Hamburg's senator for science, once declared: "In the final analysis, it's a matter of giving survival knowledge priority over destructive knowledge." This, at any rate, has been understood in Austria and its minister for science, Fischer, is clearly acting in accordance with this maxim.

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SCIENTIFIC AND INDUSTRIAL POLICY

FRG FIRMS AGAIN INVESTING MORE IN R&D AS LONG-RANGE POLICY

Munich INDUSTRIEMAGAZIN in German Sep 85 pp 183-184

[Article: "Industrial Research--Finally Light in the Tunnel"]

[Text] German enterprises are once again investing more in research and development. This is partly motivated by long-term strategic considerations.

"In 1984 the enterprises which we studied spent about 7 percent more for research and development as in the previous year," states the Kiel industrial economics professor Klaus Brockhoff, who has since 1964 been putting the futurist activities of German companies under the microscope (see table). His study shows that for the first time after a long interval some real growth is evident.

In the forefront in terms of budget increases in 1984 were Nixdorf Computer AG, Hell GmbH, W. C. Heraeus GmbH and the Stuttgart Standard Electric Lorenz AG (SEL).

For the past several years enterprises such as the Boehringer Mannheim GmbH, Gutehoffnungshuette Stock Company, E. Merck, Messerschmitt-Boelkow-Blohm GmbH and Wacker Chemicals GmbH have been intensifying their research activity. Brockhoff believes that "in the individual case it is not just a momentary increased budget for investments which is involved, but also a systematic long-term policy."

On the other hand sharp growth in sales has had the consequence that in some large firms research and development intensity has dropped off.

The Saar Mining Works AG and German Shell AG have in absolute terms even done less than previously in research. In the case of the Saar Mining Works this was in part because of the expiration of large publicly supported projects.

In general the professor deplores the fact that German enterprises have reported on their research activities no more copiously and no more intelligibly than in previous years: "The existing obligation to issue reports on research and development seems still to have had no effect, at least not with respect to the release of quantitative data."

Things Are Looking Up--What German Enterprises Are Spending on Research and Development

Enterprises	Area	R&D Outlays, millions of marks		Research Fraction, %*		1984 Research Focal Points
		1983	1984	1983	1984	
1	2	3	4	5	6	7
AEG (Concern), Frankfurt	Electronics	741	791	6.43	7.18	Automated manufacturing; pattern recognition; optical communications technology; millimeter-wave technology; solar energy; microelectronics
Aesculap Works, Tuttlingen	Medical technology	8	--	4.60	--	Orthopedics/traumatology (osteosynthesis, hip and knee joint prostheses); new metal alloys and new plating processes for implants
BASF AG, Ludwigshafen	Chemistry	1,316	1,380	3.74	3.42	Plant protectants and pharmaceuticals; paints and dyes; vitamins; biotechnology; high-performance synthetic materials; information technology
Bayer (World),	Chemistry	918	1,956	4.45	4.54	Genetic engineering; inorganic specialties; high-performance chemicals
Bayer AG, Leverkusen			1,028	6.27	6.34	
BBC AG, Mannheim	Electronics	540	510	10.91	10.59	AC servomotors; new materials; electric cars and high-energy batteries; electronic components; rotatable antennas for shortwave

Table (continued)

1	2	3	4	5	6	7
Boehringer, Ingelheim	Pharmaceuticals	510	561	13.84	13.59	Pharmaceuticals for the treatment of cardiac/circulatory disorders, respiratory disorders and gastrointestinal disorders; genetic engineering
Boehringer, Mannheim GmbH	Pharmaceuticals	173.5	204.3	15.00	16.84	Cardiac, circulatory, metabolic and autoaggression disorders; analytic systems; biochemistry, production of monoclonal antibodies
Robert Bosch GmbH (World), Stuttgart	Electronics	827	906	5.13	4.93	Microelectronics; communications engineering; materials; measuring and testing processes; efficient data transmission between CAD systems
Chemical Works Huels AG, Mari	Chemistry	160	170	3.10**	2.70	Biotechnology; process chemicals; fine chemicals; technical construction materials
Daimler-Benz AG (Concern), Stuttgart	Automobiles	1,500	1,500	3.75	3.45	Futurist materials, technologies and processes (ceramics, fiber compounds); applications of microelectronics
German Shell AG, Hamburg	Petroleum	38	35	0.20	0.14	Introduction of unleaded gasoline; further development of fuel quality; development of special engine lubricants for use with methanol

Table (continued)

1	2	3	4	5	6	7
Draegerwerk AG, Luebeck	Medical technology	35	37	6.70	6.90	Medical technology; higher-quality materials; electronic gas measuring technique; monitoring technique; aeronautics and astronautics; sensors
Dynamite Nobel AG (Group), Troisdorf	Chemistry/ plastics processing	80	84	2.79	2.68	Special explosives and detonators; chemical syntheses with special safety requirements; silicon chemistry; lubricants; plastics
Enka AG (Group), Wuppertal	Chemistry	120	134	3.03	2.91	Synthetic yarns (Aramid fiber, silica fiber); carbon fibers; further development of dialysis membranes for medical use; engineering plastics
GHH Stock Company, Oberhausen	Machines	549	601	3.50	3.61	Energy and nuclear technology; astronautics and transport; materials science; control technology; light construction
Henkel KGaA (Concern), Duesseldorf	Chemistry	207	215	4.65	4.46	Solvent-free adhesive systems and special products which adhere to moist or oily surfaces; biotechnology
W. C. Heraeus GmbH (Concern), Hanau	Metals, medical technology	34	41	1.26	1.34	Engineering ceramics (aluminum nitride); physiological implants; contact components for microelectronics; laser technology for medical and industrial applications

Table (continued)

1	2	3	4	5	6	7
Hoechst (World),	Chemistry	1,617	1,818	4.35	4.39	Diagnostic systems; genetic engineering (human insulin); blood pressure reducing medications; new antibiotics; new vaccines (against Herpes simplex virus); plant protectants
Hoechst AG, Frankfurt		726	788	5.58	5.51	
E. Merck (Group),	Pharmaceuticals	160	182	5.99	6.03	Cardiovascular therapy; central nervous system; biomaterials (antibiotic bone cements)
E. Merck (Concern), Darmstadt		128	143	9.93	10.03	
Messer Griesheim GmbH, Frankfurt	Chemistry, metals	51	52	4.60	4.40	Special gas mixtures and gas logistics; refrigerative manufacturing; biotechnology and medicine; CO_2 laser technique and electric beam technique
MBB GmbH, Ottobrunn	Aircraft	215	233	3.66	4.07	High-performance fiber compound materials; microelectronics; cybernetics; CAD/CAM manufacturing control
Nixdorf Computer AG (Concern), Paderborn	Electronics	254	323	9.40	9.87	Computer nets; artificial intelligence; digital communications technology; software
Ruhr Coal AG (Concern), Essen	Mining	268	280	1.46	1.25	Economic improvements in mining operations and processing facilities; new technologies for coal enrichment; environment protection

Table (continued)

1	2	3	4	5	6	7
Saar Mining Works AG, Saarbruecken	Mining	108	64	1.64	0.92	Bituminous coal mining; coking technique; power plant technology; coal liquefaction; heat recovery and waste recycling; uranium ore mining
Schering (Group),	Pharmaceuticals	433	465	10.10	9.51	Modern diagnostic procedures (nuclear spin tomography); plant protectants; galvanotechnology (adherent metallic coatings of conductors and electronic components); industrial chemicals; genetic engineering
Schering AG, Berlin/ Bergkamen		302	311	15.20	14.44	
SEL AG, Stuttgart	Electronics	425	509	11.66	13.23	"System 12 B" digital communications facility in the office; optoelectronics; mobile communications; glass-fiber technology
Siemens AG, Munich	Electronics	3,500	3,800	8.86	8.30	Microelectronics; optical communications engineering; information technology; manufacturing technology; medical technology
Telephone Construction + Normal Time, Frankfurt	Electronics	100	104	6.07	5.62	Data transmission; telecommunications network structures; broadband systems; terminal technology

Table (continued)

1	2	3	4	5	6	7
Volkswagen AG (Concern), Wolfsburg	Automobiles	1,443	1,400	3.60	3.06	Low-pollution engines; microprocessor technology; emission reduction; freedom from maintenance; reduction of soot emission in diesel engines
Wacker Chemicals GmbH, Munich	Chemistry	80	102	5.01	5.11	Biotechnology; odorants; computer technology; new forms of sintered materials; plant protectants; ceramic materials; copolymers and terpolymers
Carl Zeiss, Oberkochen	Precision mechanics, optics	89	104	9.30	9.98	Laser technology; microanalysis; metrology; medical-optical devices

* R&D expenditures as a fraction of sales profits.
** Estimated.

Source: Calculations of Prof Dr Klaus Brockhoff, Institute for Industrial Economics, University of Kiel.

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GREEK OPPOSITION VIEW ON TRANSFER OF MILITARY TECHNOLOGY

Athens MESIMVRINI in Greek 2 Oct 85 p 6

[Article by K. Kolmer: "Why Russians Rob The West Yet Keep Missing The Boat"]

[Text] "Today's adequacy will be tomorrow's obsolescence if technology fails to keep pace."

Soviet Acquisition of Significant Western Military Technology. An update - Sept. 1985.

In the good old days patriotism, human passions and money motivated espionage. Today it is chiefly to ensure technological superiority. And this is natural, for in a technological era such as ours whoever has the latest technological development not only achieves financial profits but also an undoubted superiority in the field of national security. Thus the protection of technology constitutes an essential factor in relation to its creation.

"The protection of technological secrets," U.S. Secretary of National Defense Caspar Weinberger declared recently, "is a vital element in the defense of the West, since without our technological superiority it would not be possible to continue deterring the adversary from making aggressive moves."

In recent years, as technology develops rapidly, we have witnessed a Soviet campaign to obtain through any means the technological secrets of the West. These efforts of the Soviets are ascribed not so much to the fact that it is relatively easy--and cheap--to appropriate the free market's technological achievements as--chiefly--to the indisputable knowledge that the controlled market is unable to produce a new technology or that whenever it does so this is done at frightful costs (e.g. space aeronautics). Socialism consumes new ideas, it doesn't produce them.

Strategic character

As is already clear, Soviet appropriation of western technological achievements chiefly have a strategic character, they are rarely related to improving the situation of the Soviet citizen and consumer. But specialization also has its drawbacks because it limits research.

Continued Dependence

Despite the Soviets' systematic efforts in the last decade to appropriate the West's technological achievements, their possibilities of lessening the Soviet Union's dependence on the West are limited. In reality, the technological gap between East and West is increasing in favor of the latter.

The reason being that the communist system suffers from an endemic lack of motivation that could have mobilized the necessary talent for technological advance. Furthermore, extensive Soviet bureaucracy, excessive secretiveness and the isolation of Soviet technologists from the advanced West condemn the Soviet Union to an increasing technological lag. This lag will become even more noticeable than today after 1990, as the West will take ever more extensive measures to prevent the leakage of its technological secrets, on the one hand, and, on the other hand, the need for renewal and for new technological inventions will give rise to a new generation of technologically advanced products, among them electro-optics, nuclear and high energy lasers, composite materials and new fuels, lubricants and means of refrigeration.

The secret of Western technological superiority can be ascribed to the fact that private enterprise deals with the renewal--the "destruction of existing production equipment," as Schumpeter said--and not governments. According to OOSA [OECD] data, in the last decade private enterprise in the West spent more than Western governments on research and technological development (R+D). Nowadays they cover 2/3 of the total R+D expenditure in the Western world. And greater resources for R+D from private enterprises mean more discoveries.

This has been proven from the time of the steam-engine up to silicon chips. And more discoveries mean increased prosperity and an improvement in the standard of living of more people. So that in this way technology becomes a means to serve man instead of being self-serving. And this is in total harmony with the humanistic ideals of the western way of life. And this is also the reason why, no matter how much the Easterners strive to catch up with the Westerners on the road of technological progress, it is inevitable that they will lose. Because technology there is a means of maintaining the system instead of renewing it.

Means of Protection

Defense requires technological security just as much as [it does] means of warding off assault. That is why, whenever there is talk of a drastic decrease in the number of Soviet diplomats and other officials in the West, the move should always be evaluated by the criteria of the defense interests of the West--and not of courtesy between nations. However, the chief means of protecting the West's technological superiority is not secrecy and controls but rather protecting the capitalistic system's capacity for renewal. Because, whereas secrecy has its drawbacks and controls are never foolproof, continuous renewal forces the opposite side into continually lagging behind. And this is the "perfect weapon," because it inspires doubts in the opponent. Torturing doubts as to whether his systems will work as well as those of the

adversary, since they are only a copy.

The method of expulsion and of eliminating all Soviet espionage posts could be another simple and easy means to stop the leakage of technological secrets to the Soviet Union. But we would not advise it. Because it would elicit immediate reprisals from the Soviets, with the closing of all the embassies in Moscow.

Do they also engage in industrial espionage? The embassies of the big nations in the Soviet capital engage chiefly in espionage--and, on the side, in industrial espionage. But where a country as tightly sealed as the Soviet Union is concerned, "hearing" what is being said and what is happening locally is more significant than the loss of a few "secrets" of a society like the West's, which is open in any case."

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TECHNOLOGY TRANSFER

BRIEFS

FINNISH COMPUTER EXPORT TO USSR--Cadmatic Computer Services Ky, belonging to the Turku-located Elematic firm, has sold a designing package to the Soviet Union. The computer programs contained in the package represent a new area in Soviet trade. The Turku firm has entered into an agreement with Metallurgimportin "involving designing of complicated machinery used when planning the moving or operating of power stations." In other words, the Turku firm is going to prepare computer-aided design programs and components needed for constructing the design models, and will provide required training in modeling technology, as well as sell the Soviets two laser cameras developed by the two companies. Geometric data is to be transferred to the computer memory with aid of the cameras. The value of the sale is estimated to be approximately 2.5 million markkas. The computer programs are entirely of domestic origin. The contract does not include any actual computer hardware. [Text] [Helsinki HELSINGIN SANOMAT in Finnish 20 Oct 85 p 47]

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